UNITED STATES OF AMERICA:
WAR DEPARTMENT.

MONTHLY WEATHER REVIEW.

(GENERAL WEATHER SERVICE OF THE UNITED STATES.)

JUNE, 1886.

PREPARED UNDER THE DIRECTION OF
BRIG. & BVT. MAJ. GEN'L W. B. HAZEN,
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SIGNAL OFFICE.
1886.

List of merchant marine steam and sailing vessels from which International Simultaneous Meteorological reports were received at the Office of the Chief Signal Officer, U. S. Army, Washington, D. C., in time to be used in the preparation of the Weather Review for the month of June, 1890.

Name of vessel.	Captain.
Allan Line.	
Br. s. s. Buenos Ayrean	Capt. J. Scott.
Canadian	J. Kerr.
Circassian	Wm. Richardson.
Grecian	C. E. LeGallais.
Norwegian	R. Carruthers.
Nova Scotian	R. H. Hughes.
Scandinavian	Alex. McDougal.
Siberian	S. P. Moore.
American Line.	
Br. s. s. British King	John Kelly.
British Princess	E. H. Freeth.
Am. Illinois	Geo. H. Dodge.
Br. s. s. Lord Clive	P. Urquhart.
Anchor Line.	
Br. s. s. Acadia	John McKeague.
Anchoria	J. J. Small
British Queen	R. Willis.
British Crown	Archibald Smith.
Circassia	A. Campbell.
City of Rome	R. D. Monroe.
Devonia	Hugh Young.
Olympia	James Brown.
Trinacria	G. Mitchell.
Arrow Line.	
Br. s. s. Crystal	B. B. Stannard.
Atlas Line.	
Br. s. s. Atlas	J. W. Samson.
Span. Alps	T. Annesgastl.
Br. Alvena	O. Hughes.
Alvo	David Williams.
Span. Andes	D. d'Anesagga.
Br. Chariot	J. M. MacKnight.
Bank's S. S. Co. (limited).	
Br. s. s. Chestnut	Thomas Burley.
Baltimore Steam Navigation Company.	
Fr. s. s. Chateau Lafite	C. Journoll.
Bermuda Line.	
Br. s. s. Brooklyn City	W. Fitt.
Wells City	T. L. Weiss.
Cromwell Line.	
Am. s. s. Hudson	H. S. Freeman.
Louisiana	E. V. Gager.
Cunard Line.	
Br. s. s. Aurania	W. H. P. Haines.
Catalonia	Alex. McKay.
Etruria	T. Cook.
Gallia	M. Murphy.
Pavonia	R. Woolfenden.
Servia	H. McKay.
Edward Carr's S. S. Line.	
Swed. s. s. Australia	G. Frank.
Polynesia	A. Kuhn.
Furness Line.	
Br. s. s. Boston City	W. T. Sherborne.
Durham City	M. P. Land.
General Trans-Atlantic Steamship Co.	
Fr. s. s. Gabrielle	P. d'Hauterive.
La Bourgogne	Frangael.
La Champagne	Tranb.
La Normandie	de Kersabiec.
St. Laurent	Bagneaux.
Great Western S. S. Line.	
Br. s. s. Dorset	Ch. Off. Wm. H. Bates.
Severndonian	Capt. T. H. Milne.
Guion Line.	
Br. s. s. Alaska	G. B. Murray.
Arizona	S. Brooks.
Nevada	John Douglas.
Wisconsin	Edward Bentley.
Wyoming	C. L. Rigby.
Hamburg-American Line.	
Ger. s. s. Bohemia	R. Karlowa.
Gellert	W. Kühlewein.
Lessing	H. Barends.
Rhenfels	H. Vogelgesang.
Rugia	A. Albers.
Saxonia	C. Ludwig.
Wieland	C. Hebich.
Westphalia	K. Kopff.
Inman Line.	
Br. s. s. Baltic	Geo. Burton.
City of Berlin	Francis S. Land.
City of Richmond	A. W. Lewis.
Johnson Line.	
Br. s. s. Ramunder	John Inch.
Lamport & Holt's Steamship Company.	
Br. s. s. Avon	F. Graham.
Euclid	A. W. Pyne.
Belg. Hippocrates	W. Kelley.
Br. Mosaic	T. Sawyer.
Leyland Line.	
Br. s. s. Bavarian	R. Lessk.
Bulgarian	E. Parry.
Lucania	C. J. Calnes.
Virginian	M. Fitt.
Mallory Line.	
Am. s. s. Alamo	S. Risk.
Empress	M. B. Crowell.
San Marcos	A. C. Burrows.
Mex. & Jamaica S. S. Co.	
Br. s. s. Montreal	F. Bouchette.
Ontario	W. F. Couch.
Sarnia	Joseph Gibson.
Toronto	Jas. McAuley.

Name of vessel.	Captain.
Monarch Line.	
Br. s. s. Assyrian Monarch	Capt. John Harrison.
Egyptian Monarch	W. S. Morgan.
Persian Monarch	F. Paton.
National Line.	
Br. s. s. Canada	T. Foote.
Denmark	Geo. Cochrane.
Egypt	J. Sumner.
England	T. P. Heeley.
France	A. D. Hadley.
Greece	A. J. Jedfey.
Helvetia	G. Cochrane.
Holland	W. Tyson.
Italy	W. Pearce.
The Queen	T. Milligan.
Navigazione Generale Italiana.	
It. s. s. Entella	M. Rossaca.
Indipendente	F. Piranodio.
New York and Cuba Mail S. S. Co.	
Am. s. s. Clenfuegos	C. M. Faircloth.
N. Y., Havana & Mexican Mail S. S. Co.	
Am. s. s. City of Alexandria	J. W. Reynolds.
City of Washington	W. M. Rittig.
North German Lloyd Steamship Co.	
Ger. s. s. Aller	F. Hanselmann.
America	G. Meyer.
Donau	C. Pohle.
Eider	H. Heimers.
Elbe	H. Richter.
Ems	T. Jungst.
Frida	R. Ringk.
Main	H. Christoffers.
Rhein	C. Wiegand.
Trave	W. Willigerod.
Werra	R. Busenius.
Occidental & Oriental Steamship Co.	
Gaelic	W. G. Pearne.
Ocean Steamship Company.	
Am. s. s. Chattahoochee	J. W. Catharine.
City of Augusta	K. S. Nickerson.
City of Savannah	Ch. Off. Edwards.
Juniata	Capt. S. L. Askins.
Old Dominion Steamship Company.	
Am. s. s. Manhattan	Frank Stevens.
Oregon Railway and Navigation Co.	
Am. s. s. Columbia	Fred Bolles.
Oregon	E. Peirmann.
Pacific Coast Steamship Company.	
Am. s. s. Orizaba	John N. Ingalls.
Pacific Mail Steamship Company.	
Am. s. s. City of Para	L. Dexter.
City of Rio de Janeiro	W. B. Cook.
Colon	Chas. C. Lima.
San Blas	Thos. Chapman.
Quebec Steamship Company.	
Br. s. s. Orinoco	Jas. S. Garvin.
Trinidad	W. J. Fraser.
Red Cross Line.	
Br. s. s. Capulet	W. H. Ellis.
Theresina	J. Kempthorne.
Red "D" Line.	
Am. s. s. Philadelphia	Sam. Bess.
Red Star Line.	
Belg. s. s. Belgenland	W. A. Beynon.
Nederland	Allen J. Griffin.
Noordland	H. E. Nickels.
Pennland	Rud. Weyer.
Rhynland	J. C. Jamison.
Switzerland	H. Buschmann.
Waesland	J. Uberweg.
Westernland	Com. W. G. Randle.
Rotterdam Line.	
Dtch. s. s. Leerdam	Capt. P. Sliverdregt.
P. Caland	T. H. Bonjer.
Schiedam	C. Bakker.
Zaandam	H. von der Zee.
State Line.	
Br. s. s. State of Georgia	C. Moodie.
State of Indiana	A. Ritchie.
State of Pennsylvania	A. J. A. Mann.
State of Nebraska	A. G. Brace.
Thingvalla Line.	
Dan. s. s. Geiser	C. W. Moller.
Island	W. Skjoldt.
Thingvalla	S. T. H. Lash.
Twin Screw Line.	
Br. s. s. Richmond Hill	A. Hyde.
Tyne & Wear Steamship Co.	
City of Newcastle	W. T. Irving.
Warren Line.	
Br. s. s. Iowa	Samuel Walters.
Kansas	W. Gleig.
Norseman	E. Madden.
Wells, Ward Line.	
Br. s. s. Richmond	J. Gadsen.
White Cross Line.	
Belg. s. s. De Keyser	J. J. Barnes.
Jan Breydel	H. Meyer.
White Star Line.	
Br. s. s. Adriatic	H. Parsell.
Britannic	H. Perry.
Celtic	B. Gledhill.
Germanic	C. W. Kennedy.
Republic	P. J. Irving.

Name of vessel.	Captain.
Wilson Line.	
Br. s. s. Bessano	Capt. W. Rea.
Bravo	C. Smith.
Buffalo	J. H. Malet.
Chicago	J. W. Jones.
Galileo	Richard Potter.
Marengo	W. Abbott.
Otranto	W. Ripperth.
Salerno	S. H. Rogers.
Miscellaneous.	
Br. s. s. Camden	S. R. Chandler.
Craighill	W. H. Bennett.
Cranbrook	John W. Harvey.
Edith Golden	John H. Bennett.
El Callao	J. Scholtz.
Elston	T. Robertson.
Span. Emiliano	D. F. de Bengoa.
Br. Joseph Ferens	J. J. Mehegan.
Lord Lansdowne	C. H. Backhill.
Am. Lorenzo D. Baker	Warren F. Wiley.
Br. Madrid	M. Garson.
Matthew Bedlington	Thomas Kirby.
Picqua	J. H. Prouse.
Ger. Prinz Frederick Carl	F. H. Storm.
Br. Resolute	R. C. Readyley.
Rydal Water	Ch. Off. H. Cullieghan.
Saint Ramuns	Capt. R. Campbell.
Vindelana	Thos. Harrison.
"New York Herald Weather Service."	
Br. Adriatic	H. Parsell.
Alba	J. W. Samson.
Advance	J. R. Beers.
Alaska	G. S. Murray.
Albano	H. R. Hughes.
Alene	— Sellers.
Alvena	O. Hughes.
Aurania	W. H. P. Haines.
Alvo	D. Williams.
Arizona	Sam. Brooks.
Baltic	G. Burton.
Belg. Belgenland	W. A. Beynon.
Br. Bessel	C. J. Watson.
Britannic	H. Perry.
City of Alexandria	J. W. Reynolds.
City of Berlin	F. S. Land.
City of Chester	B. Condron.
City of Chicago	Fred Watkins.
City of Montreal	A. Radford.
Am. City of Puebla	John Decken.
Br. City of Richmond	A. Lewis.
Am. Colon	Chas. Lima.
Br. Craighill	W. H. Bennett.
Ger. Donau	C. Phole.
Br. Etruria	T. Cook.
Ger. Ems	W. Willigerod.
Am. Eureka	J. B. Perry.
Ger. Lessing	B. Voss.
Belg. Nederland	A. J. Griffin.
Am. Newport	W. G. Shackford.
Belg. Noordland	N. E. Nickels.
Br. Olympia	Jas. Brown.
Dtch. P. Caland	T. H. Bonjer.
Belg. Pennland	R. Weyer.
Br. Republic	P. J. Irving.
Richmond Hill	A. Hyde.
Belg. Rhynland	J. C. Jamison.
Am. San Marcos	A. C. Burrows.
Dtch. Schiedam	G. Bakker.
Br. Servia	A. McKay.
State of Nebraska	A. G. Brace.
State of Pennsylvania	A. J. A. Mann.
Belg. Switzerland	N. Buschmann.
Dtch. W. A. Scholten	S. J. Vis.
Br. Westernland	Com. W. G. Randle.
Wisconsin	Capt. E. Bentley.
Wyoming	C. L. Rigby.
Sailing vessels.	
Am. bg. Abbie Clifford	D. W. Storer.
Br. Achsah	A. M. Shaw.
Am. schr. Annie R. Lewis	L. L. Lewis.
bg. Arcot	J. W. Cates.
Br. sp. Casanres	J. C. Barrette.
Am. schr. Comet	W. H. Aldrich.
bg. Ernestine	E. R. Norton.
schr. Ettie H. Lister	S. D. Mason.
Nor. sp. Ferdinand	H. Lütken.
Am. bg. Georgietta	Ch. Off. H. K. Combs.
Ger. bk. Godefroy	Capt. C. H. Stunig.
Nor. bk. Groadloven	O. G. Ellingsen.
Am. bg. Jane Adeline	B. Lathrop.
Ger. bk. Leocadia	J. Stohff.
Br. bg. Lillian	H. F. Schive.
Am. bg. L. & W. Armstrong	A. Alexander.
Am. schr. Maggie Abbott	D. C. McIntosh.
bg. Mary Fink	D. B. Darrah.
bg. Mary L. Stone	G. L. Josselyn.
schr. Mary Jane Elizabeth	C. E. Bohannon.
bkt. Nellie M. Slade	J. A. Gould.
Dan. bk. Nellie	N. P. Hansen.
Am. bk. Ellie Baker	Jas. H. Carty.
Aust. The Lord Warden	G. N. Cusenack.
Ger. sp. Union	H. Fokken.
Br. sp. Winnifred	S. Mac Donald.

MONTHLY WEATHER REVIEW.

VOL. XIV. WASHINGTON CITY, JUNE, 1886. No. 6.

INTRODUCTION.

This REVIEW contains a general summary of the meteorological conditions which prevailed over the United States and Canada during June, 1886, based upon the reports from the regular and voluntary observers of the Signal Service and from co-operating state weather services.

Descriptions of the storms which occurred over the north Atlantic Ocean during the month are also given, and their approximate paths shown on chart i. In tracing the centres of the paths of these storms, data from the reports of one hundred and seventy-two vessels have been used.

The southward movement of ice massed to the northward of Newfoundland has been unusually late, and large quantities of fixed ice were reported off the coast of Labrador at the close of the month.

On chart i for this month are traced the paths of eleven areas of low pressure; the average number for June during the last thirteen years being 8.7. The areas described as numbers viii and xi were probably of tropical origin; during the northward movement of number xi over the Gulf and across the Florida Peninsula on the 30th it was accompanied by gales and very heavy rainfall.

The mean atmospheric pressure, as compared with that for June of previous years, shows only slight departures from the normal.

The temperature for the month was generally below the normal over the entire country except in the northwestern portions and in southern Florida, the most marked deficiencies occurring in the middle and south Atlantic states.

The rainfall over the western and northern portions of the country was deficient, while a very large excess occurred in the region south of the Ohio and east of the Mississippi rivers.

Drought has prevailed during the month in many districts, being severest in Dakota, Iowa, Texas, and Indian Territory.

Chart vi exhibits curves representing results of observations with the electrometer upon atmospheric electricity, and under that head will be found notes referring to the same.

In the preparation of this REVIEW the following data, received up to July 20, 1886, have been used, viz., the regular tri-daily weather-charts, containing data of simultaneous observations taken at one hundred and thirty-three Signal Service stations and sixteen Canadian stations, as telegraphed to this office; one hundred and sixty-two monthly journals; one hundred and sixty monthly means from the former, and sixteen monthly means from the latter; two hundred and eighty-three monthly registers from voluntary observers; sixty-two monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs furnished by the publishers of "The New York Maritime Register;" monthly weather reports from the New England Meteorological Society, and from the local weather services of Alabama, Colorado, Georgia, Indiana, Minnesota, Missouri, Nebraska, Ohio, and Tennessee, and of the Central Pacific Railway Company; trustworthy newspaper extracts, and special reports.

ATMOSPHERIC PRESSURE.

[*Expressed in inches and hundredths.*]

The distribution of mean atmospheric pressure for June, 1886, determined from the tri-daily telegraphic observations of the Signal Service, is shown by isobarometric lines on chart ii.

The mean pressure for the month is greatest along the coast of Washington Territory and Oregon, where the barometric mean is shown by the isobar of 30.05. The mean pressure for Iowa and all of the United States lying east of the Mississippi River ranges from 29.92 to 29.98 and averages about 29.95. The pressure in Canada ranges from 29.95, in the lower lake region, to 28.85, in the lower part of the Saint Lawrence Valley. The area of barometric minima is enclosed by the isobar of 29.80, and covers an extensive portion of country, including Arizona, Nevada, Utah, Colorado, New Mexico, and western Texas. A small area, enclosed by the isobar of 29.75, lies in the southwestern part of Arizona; one station, Yuma, reporting a mean of 29.74.

The departures from the normal pressure are given in the tables of miscellaneous meteorological data, and are also shown on chart iv by lines connecting stations of equal departure. The pressure for the month is about normal, or slightly above, over the whole country, except in California, Texas, and the region lying south of the state of Pennsylvania and the Ohio River and east of the Mississippi River.

The mean pressure for June, when compared with that of the preceding month, shows an excess of .07 in New England, from which district it gradually decreases toward the west and southwest, until along the Missouri and Ohio rivers, and eastward through North Carolina, it coincides with the pressure for May. Over the remainder of the country the pressure is less than that of May, the greatest deficiency occurring in the southwestern districts.

BAROMETRIC RANGES.

The monthly barometric ranges at the various Signal Service stations are also given in the tables of miscellaneous data. The greatest ranges occurred in New England and westward to the Rocky Mountains. In the southern districts and along the Pacific coast the ranges were comparatively small.

The following are some of the extreme monthly ranges:

Greatest.	Inch.	Least.	Inch.
Portland, Maine	0.92	San Diego, California	0.27
Eastport, Maine	0.86	Key West, Florida	0.29
Boston, Massachusetts	0.83	Sanford, Florida	0.30
Albany, New York	0.83	Mobile, Alabama	0.32
Block Island, Rhode Island	0.82	Savannah, Georgia	0.32
New Haven, Connecticut	0.82	Chattanooga, Tennessee	0.32
Atlantic City, New Jersey	0.81	Los Angeles, California	0.32
New York City	0.80	Fort Davis, Texas	0.32
Sandy Hook, New Jersey	0.80	New Orleans, Louisiana	0.34

AREAS OF HIGH PRESSURE.

Seven areas of high pressure appeared within the limits of the United States during the month of June, 1886. They were

generally first observed north of latitude 50° and near the centre of the continent, although three of these areas approached from the Pacific coast, one of which crossed the Rocky Mountains north of Montana, and the remaining two extended over the north Pacific coast region until they disappeared, either to the north of the stations of observation, or by a gradual decrease of pressure. The general direction of movement was to the southeast while these areas covered the central portions of the continent, and the movement became more easterly as they approached the Atlantic coast. On the Pacific coast the general direction of movement was between north and northeast, with the exception that the area which crossed the Rocky Mountains moved directly east from British Columbia to the region north of Dakota. The high areas which reached the Atlantic coast all passed to the north of Virginia.

I.—This area of high pressure extended over the north Pacific coast region on the morning of June 1st, the barometer being below 30.20; it moved directly eastward, attended by increasing pressure, and on the morning of the 2d was clearly defined and central near the northern boundary of Montana, where the pressure had increased to 30.30, the high area at this time extending over the Missouri Valley and eastward to Lake Superior. The reports from the north Pacific coast showed a decrease of pressure ranging from .10 to .20, and indicated that this area of high pressure had passed to the east of the Rocky Mountains. During the 2d the movement was southeasterly over the Missouri Valley, attended by cool northerly winds and fair weather, and preceded by rains in the regions to the south and east, the rains occurring immediately before, or soon after, the winds shifted to the south, after which generally fair weather prevailed, except in the Gulf and south Atlantic states where the rains continued, with northeast winds, until this area disappeared east of New England on the 5th. It moved directly eastward from Iowa during the 3d and 4th, and was central south of Nova Scotia, near latitude 40°, on the morning of the 5th. This is the only area of high pressure observed during the month which passed eastward from the Pacific to the Atlantic, having its position approximately located at each of the tri-daily reports from the time of its first observation until its final disappearance.

II.—This area appeared north of Minnesota and Lake Superior on the morning of the 7th; it moved directly southeastward over the Lake region and was preceded by the development of an area of low pressure in the east portion of the Lake region; this low area moved northeastward with increasing energy, the path of the centre of the low area being almost perpendicular to that of the high area, and twenty-four hours after its development the area of high pressure covered, and was central over, the region where the area of low pressure was first observed. From the Lake region it passed over the middle Atlantic states, preceded by local rains along the Atlantic coast south of New York. It disappeared during the 9th to the east of the middle Atlantic states, the pressure decreasing as it approached the coast.

III.—This area appeared on the north Pacific coast at the 10 p. m. report of the 9th, apparently advancing slowly to the northeast; it remained almost stationary from the 9th to the 13th, and was preceded by an extended area of low pressure in the Rocky Mountain regions. When this area of low pressure developed energy and moved eastward, there was a general increase of pressure over the Rocky Mountain regions, which apparently resulted from this area of high pressure, although its movement cannot be traced from the tri-daily charts.

IV.—This was an area of relatively high pressure which formed in the Lake region and upper Mississippi valley on the 10th, while the barometer was low in the Saint Lawrence Valley and Rocky Mountain regions. It moved eastward and the pressure increased slightly during the 10th, and on the morning of the 11th it was central in the lower lake region. The pressure continued to increase during the 11th and 12th within this area, and on the 13th the area extended over Nova Scotia and New Brunswick and thence southward to the south Atlantic coast, the barometer being from .10 to .20 higher than it was when this area was in the Lake region. The reports indicate that this high area formed within the limits of the United States near the centre of the northern boundary, and there was a gradual increase of pressure attending the easterly movement. The weather was generally cool within this area, and snow fell on Mount Washington, New Hampshire, on the 13th, after the winds had shifted to easterly, and when the centre of the area was over New Brunswick.

V.—This area appeared on the 16th on the Pacific coast, where it remained until the 25th, with slight oscillations in pressure. It extended along the coast from southern California northward to British Columbia, the movement being northward, and the centre remaining to the west of the coast line. The barometer remained low during the greater part of this period in the Rocky Mountain regions. On the 19th and 20th there was an increase of pressure in the northern Rocky Mountain regions and on the north Pacific coast, resulting in the formation of a secondary high area east of the Rocky Mountains. This area extended over the upper Mississippi and Missouri valleys and southward to Texas, and probably caused the increase of pressure over the Southern States during the 24th and 25th, but the gradient was slight and no definite movement of the distinct high area could be traced from the charts. The main portion of this area remained to the west of the Rocky Mountains and disappeared during the 25th, although the barometer continued generally above the normal on the Pacific coast during the remainder of the month.

VI.—This area of high pressure was first observed central north of Minnesota on the morning of the 17th, being bounded by the isobar of 30.0, while the barometer was below 29.4 in the Saint Lawrence Valley. It extended southward over the central valleys during the 17th and 18th, after which it moved eastward from the Northwest to the middle Atlantic states and New England during the 19th and 20th, attended by fair weather in all districts east of the Mississippi. It was central off the New England coast on the morning of the 21st, the pressure having increased .30 during the transit from the upper Mississippi valley.

VII.—This area was first observed north of Minnesota on the afternoon of the 26th, and when low areas were observed to the east in the Saint Lawrence Valley, to the west north of Montana, and to the southwest in the Rio Grande Valley. It moved slowly southward, extending over the Lake region and Northwest during the 27th, 28th, and 29th, remaining central near the northern boundary of Minnesota. At the close of the month it was apparently moving eastward north of the Lake region, attended by clear weather in all sections, except on the south Atlantic and east Gulf coasts.

AREAS OF LOW PRESSURE.

Eleven areas of low pressure have been traced from the tri-daily weather charts of June, 1886. The most marked feature of the movement of the low areas for June is that but one has been traced from the Rocky Mountain region eastward over the Mississippi Valley. Five of the low areas traced passed eastward to the Atlantic north of the Saint Lawrence River; two were first observed in the east Gulf, causing severe gales on the Florida and south Atlantic coasts—one severe storm occurred in the west Gulf; and two developed in the Rocky Mountain regions, and one of these passed southward to Texas, the other moved eastward over British America and disappeared after reaching the longitude of western Lake Superior. In connection with the area of low pressure originating in the Rocky Mountains, there appeared an area of low pressure which remained in this region from the 11th to 16th and then disappeared by an increase of pressure without definite movement of translation.

The following table shows the latitude and longitude in

which each area was first and last observed, with the average rate of movement in miles per hour:

Areas of low pressure.	First observed.		Last observed.		Average velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
	° ′	° ′	° ′	° ′	
No. I	39 00	97 00	52 00	62 00	35.0
II	45 00	81 00	50 00	57 00	30.0
III	40 00	107 00	40 00	102 00	.....
IV	25 00	96 00	30 00	93 00	14.0
V	47 00	77 00	50 00	57 00	31.0
VI	53 00	115 00	51 00	90 00	16.0
VII	43 00	111 00	36 00	98 00	27.0
VIII	24 00	87 00	39 00	72 00	17.0
IX	38 00	87 00	45 00	59 00	17.0
X	54 00	70 00	48 00	57 00	22.0
XI	16 00	80 00	30 00	83 00	29.0

Average hourly velocity, 23.8 miles.

I.—On the morning of the 1st this area was central in eastern Kansas, bounded by the isobar of 29.8, with areas of high pressure extending over New England and over the north Pacific coast and northern Rocky Mountain region. It moved to the northeast, separating the two areas of high pressure previously referred to, and passed over the Lake region on the 1st and 2d, attended by heavy local rains. These rains occurred in the western quadrants and were apparently caused by the cold north winds from the area of high pressure to the westward. These local rains were reported from the Lake region, Tennessee, and Ohio Valley on the 1st and 2d, and in the Atlantic coast districts on the 3d. This storm increased in energy as it moved northeastward over the Saint Lawrence Valley. When last observed, on the afternoon of the 3d, the pressure had decreased to 29.51 at Anticosti Island, and brisk to high southwest winds were reported at northeast stations.

II.—This area, as previously stated, developed in the Lake region, over Lake Huron, to the southeast of an area of high pressure, on the morning of the 7th. When first observed it was bounded by the isobar of 29.9; it moved to the northeastward, with decreasing pressure at the centre, causing westerly gales in the lower Saint Lawrence valley on the 8th. This low area was attended by light rains on the Atlantic coast and in the Lake region, the rains being chiefly due to changes in temperature resulting from the area of high pressure which followed. The northeasterly movement continued during the 8th, when this area passed to the eastward of Newfoundland.

III.—On the morning of the 10th areas of low pressure were observed over the southern plateau region and to the north of Dakota, and over the region separating these areas the barometer was from .20 to .30 below the normal. Local storms were reported from the Rocky Mountain regions and the upper Mississippi valley during the 11th, 12th, and 13th, while the area of low pressure remained almost stationary in the central Rocky Mountain region. There was a slight easterly movement of the central area observed during the 13th and 14th; this easterly movement resulted in the formation of several secondary low areas, which, after reaching the central valleys, attended by local storms, disappeared by a general increase of pressure during the 16th and 17th.

IV.—This storm was apparently central south of Brownsville, Texas, and to the east of the coast line, on the 13th, and the succeeding reports on the 13th and 14th indicate that it moved northward, parallel with the coast line, until it reached Galveston, Texas, on the morning of the 14th; the wind reached a maximum velocity of fifty miles from the northeast at that station on the morning of the 14th, the barometer reading 29.47. The wind shifted to the west during the 14th, when the centre was apparently near the north Gulf coast, after which it was not possible to trace the movement of this low area. This storm was very destructive in the vicinity of Galveston, Texas.

The following notes relative to this storm have been received:

Galveston, Texas: on the morning of the 13th the barometer was low, and continued falling all day, with brisk east winds. At 11.15 p. m. a gale of twenty-seven miles per hour set in and continued, gradually increasing in force. At 5.50 a. m. of the 14th the gale had attained its maximum velocity of fifty miles per hour, from the northeast. At 8.30 a. m. the barometer stood at 29.43, wind from the north and veering, and shortly after was from the northwest, when the barometer began rising slowly. At 8.05 a. m. and at 8.40 a. m. the wind was fifty miles per hour, from the north. Owing to the high east and northeast wind the water in the Gulf front rose to such an extent that there were fears of a repetition of the overflow of 1875, but the wind backing to northwest cleared the bay and prevented what might have been a serious disaster. The storm was particularly dangerous to light shipping in the harbor, many of the smaller craft being considerably damaged. Along the beach the street car and the Texas Mexican railroad lines were washed out and a dwelling house, two saloons, and numerous bath-houses were completely demolished. Rain fell at intervals during the storm.

Orange, Orange county, Texas: a very heavy northeast gale blew here all day on the 14th, doing much damage to crops and vegetation. The storm was accompanied by very heavy rainfall.

Sabine Pass, Jefferson county, Texas: between Taylor Bayou and this place eight miles of the railroad track were washed out by the storm of the 14th. Several residences, warehouses, and all the wharves at Sabine City were either blown or washed away. The water rose seven feet above the ordinary high-tide level, submerging the entire town and the country for miles in its rear. Cattle suffered severely for fresh water, as all the inland lakes and pools were impregnated with the saline waters of the Gulf.

V.—On the 16th an extended area of low pressure existed north of the Lake region and Saint Lawrence Valley. Local rains and thunder-storms were reported from the Lake region, and an area of high pressure was forming to the westward of Lake Superior. During the 17th the barometer fell rapidly in the Saint Lawrence Valley, and by morning of the 18th it had fallen to 29.07 at Anticosti, near the centre of this storm, the movements of which were definitely traced from longitude 77° W., latitude 47° N., where it was central on the morning of the 17th. Severe westerly gales occurred at northeast stations on the 18th.

VI.—This depression is approximately traced, as it was at no time within the limits of the stations of observation. It was first observed north of Montana on the afternoon of the 17th, and was last observed north of Lake Superior at midnight of the 20th. When the depression disappeared north of Lake Superior areas of high pressure were central on the middle Atlantic and north Pacific coasts, and severe gales were reported on the east Gulf coast, due to the advance or development of the storm traced as number viii.

VII.—The tri-daily reports received at midnight of the 17th indicated that a low area was developing over the southern plateau region, and, at the same report, the area of low pressure traced as number vi was central immediately to the north of Montana. The barometer was generally low in all the Rocky Mountain plateau regions, and an extended area of high pressure covered the central valleys. During the succeeding forty-eight hours there was a slow movement of this barometric trough to the eastward, attended by a corresponding movement of the high area to the eastward. As previously stated the area of low pressure disappeared to the northward of Lake Superior, while this low area moved southeastward over the Rocky Mountain regions and thence southward to the lower Rio Grande valley, where it was last charted on the afternoon of the 20th, on which date the barometer was generally low over the whole of the Gulf of Mexico, and a tropical storm, traced as number viii, was moving northward over the east Gulf.

The following note relates to this storm:

Waco, McLenan county, Texas: a heavy wind and rain storm passed over the interior and eastern portions of the state during the night of the 19–20th, doing great damage to property in towns and to crops in the country. At this place several houses were wrecked and one man wounded. Several houses were blown down in Dallas. At Weatherford a large grain warehouse, a church, and several dwellings were completely destroyed and a number of other buildings damaged. In the country large areas of cotton, corn, and other crops were destroyed and buildings blown down.

VIII.—The reports received from the West Indies show that severe gales occurred south of Cuba and west of Jamaica on the 19th, but these reports are not sufficient to justify the extension of the track of this storm south of the twenty-fifth parallel, where it was probably central, near the eighty-seventh meridian, on the morning of the 20th. This storm moved directly northward over western Florida, causing a

severe southerly gale at Key West and Cedar Keys, and dangerous easterly winds along the south Atlantic coast on the 20th, 21st, and 22d. It moved over the south Atlantic states, inclining slightly to the eastward, and passed off the middle Atlantic coast, attended by dangerous winds south of New York. After reaching the New Jersey coast the storm apparently decreased in energy and the direction of movement changed to the eastward. It was last marked as central south of Long Island, near the fortieth parallel.

The Signal Service observer at Cedar Keys, Florida, reports as follows:

At 8.35 p. m. of the 20th a heavy rain storm, accompanied by violent east and northeast winds, prevailed at this place, and continued with considerable energy all night. The wind came in squalls, blowing at times during the night at the rate of seventy-five to ninety miles per hour, shaking the strongest houses in the town and prostrating trees, telegraph poles, and signs. Between 10 and 11 p. m. the wind blew from the east sixty-eight miles per hour; this is the highest velocity ever recorded here, but owing to the direction from which it came but little damage was done.

The following information in regard to this storm has been obtained from Cuban newspapers forwarded to this office by the Rev. Benito Viñes, Director of the Belin College Observatory, Havana, Cuba:

HAVANA, CUBA, *June* 21, 1886.—The heavy rain storm which prevailed during the last few days began on the 17th and 18th, in the immediate vicinity of the Yucatan Canal and in the adjacent portion east of the Gulf, where it remained about stationary during four consecutive days. The rains were copious and persistent from the central part of the island to Cape San Antonio, on the coast of Yucatan, and in the Gulf States. The rain caused heavy floods, and various localities were inundated.—*Diario de la Marine, June* 21, 1886.

Rev. Benito Viñes, of the Belin College Observatory, also furnishes the following:

HAVANA, *June* 28, 1886.—The heavy rain which fell in Vuelta Abajo from June 17th to June 24th has been unexampled in Havana during the month of June for the last twenty-nine years.

IX.—This area of low pressure apparently developed in the lower Ohio valley during the 23d. It moved slowly northeastward as a slight depression, attended by local rains and thunder-storms in the Northern States. The barometer fell near the centre of this depression as it passed northeastward to the lower Saint Lawrence valley, and after the centre reached the vicinity of Father Point, Province of Quebec, the indications are that the direction of movement changed from northeast to southeast. This low area was apparently central to the east or southeast of Sydney, Nova Scotia, when last observed on the morning of the 27th.

X.—This area was observed far to the north of New England at midnight of the 28th. It apparently moved southeastward over the Atlantic, developing considerable energy as it passed over the Maritime Provinces. It was attended by severe gales in the Gulf of Saint Lawrence on the 29th and 30th, the barometer falling below 29.40 near the centre of disturbance. No marked changes in the meteorological conditions in the United States occurred during the movement of this storm to the eastward, and the area of high pressure which followed caused a continuation of fair weather.

XI.—This storm approached the east Gulf coast during the 30th, attended by severe gales and heavy rains. The reports received from vessels and from stations in the West Indies indicate that it existed to the south of Cuba on the 27th and 28th, and that it passed northward, probably crossing the twenty-fifth parallel near the eighty-ninth meridian on the 29th. The track of the centre of this storm is approximately given on chart i.

Rev. Benito Viñes, director of the Belin College Observatory, Havana, Cuba, has collected, and forwarded to the Chief Signal Officer, information relative to this storm, as follows:

Immediately after the 26th the barometer rose to an extraordinary height, indicating the approach of a cyclonic disturbance. On the 27th the disturbance, it seems, had existed in the sea south of the island, and during that and the succeeding day it came rapidly upon us, through the third quadrant, with heavy squalls, from the east and southeast, in the central and western provinces of the island. On the 29th the cyclonic disturbance probably crossed to the extreme west of the island.

According to a dispatch received from the mayor of Batabano, dated the 28th, 2.30 p. m., a very heavy wind from the southeast prevailed at that place, causing some damage to boats in the harbor.

The commanding officer of Fort San Fernando states that during the 28th the American schooner "Siggal" was lost and two sailors drowned; the remainder of the crew (seven in number) were saved and cared for at Fort San Fernando.

"The Guojiro of Sancti Spiritus" states that on Wednesday, June 30th, Capt. Charles W. Hunter arrived in the port at Tunas and made the following statement: Sailed with the English schooner "Daizy," the 26th; on the evening of the same date, in lat. 19° 34′, long. 79° 10′, the wind was from the east; at 10 a m. the day following, being west of Jamaica, the hurricane was at its greatest force and the sea very high. On Monday the wind calmed.

The "Diario de la Marine" (published at Havana), of June 30, 1886, contained an extract from the "El Diario de Cienfuegas," of June 28th, as follows:

At 8 o'clock this morning heavy gusts of wind from the southeast prevailed; the wind, which was moderate in force during the first hours, increased in force up to 2 p. m., blowing from the same quarter. The "El Gloria" which sailed this morning at 10 o'clock for Trinidad, arrived there at 1.30 p. m. Captain Muniátegul states that the wind was very severe and the sea high. The barometer was very high and remained stationary for twenty-four hours.

The following observations made at Coloma, Cuba, by Manuel Yago, Adjutant of Marines, were also forwarded by Rev. B. Viñes:

Time of observation.	Barometer.		Temperature.		Wind.		Sky.	Horizon.	Weather.
	Inches.	Millimetres.	Fahrenheit.	Centigrade.	Force, 0-10.	Direction.			
28th, 5 p. m	30.12	763.0	78.8	26.0	6	n.	cs.	Covered	Heavy squalls.
6 p. m	29.92	760.0	75.2	24.0	6	nnw.	ks.	Covered	Heavy squalls.
7 p. m	29.80	757.0	71.6	22.0	9	nw.	ks.	Covered	Heavy rain squalls.
8 p. m	29.63	752.5	75.2	24.0	9	w., sw.	ks.	Covered	Heavy squalls.
9 p. m	29.49	749.0	71.6	22.0	8	w.	ks.	Covered	Heavy squalls.
10 p. m	29.57	751.0	73.4	23.0	9	sw.	ks	Covered	Heavy squalls.
11 p. m	29.92	760.0	75.2	24.0	10	ssw.	ks.	Covered	Heavy squalls.
12 p. m	30.04	763.0	77.0	25.0	10	s.	ks.	Covered	Heavy squalls.
29th, 1 a. m	30.04	763.0	77.0	25.0	6	s.	ks.	Covered	Heavy squalls.
2 a. m	30.04	763.0	77.0	25.0	9	ssw.	ks.	Covered	Heavy squalls.
3 a. m	30.04	763.0	77.0	25.0	7	sse.	ks.	Covered	Heavy squalls.
4 a. m	30.04	763.0	77.0	25.0	6	se.	n.	.....	Clear in 2d quadrant.
5 a. m	30.04	763.0	77.0	25.0	5	se.	cs.	.....	Clear in 2d and 3d quadrants; thunder.
6 a. m	30.04	763.0	77.0	25.0	5	se.	cs.	.....	Clear in 2d, 3d, and 4th quadrants.
7 a. m	30.08	764.0	75.2	24.0	5	se.	cs.	Clear	Clearing.
8 a. m	30.12	765.0	75.2	24.0	5	se	ck.	Clear	Clearing.
9 a. m	30.08	764.0	75.2	24.0	5	se.	ck.	Clear	Clearing.

The following notes indicate the severity of this storm during its passage over the Florida Peninsula:

Tallahassee, Florida: on the 30th a disastrous gale occurred at this place and over the adjacent country. Rain began to fall about 4.00 a. m. and continued until midday, with occasional gusts of wind; about 12 m. a violent southeast gale set in accompanied by heavy rain, which continued until after 6 p. m. It is estimated that the wind blew at the rate of eighty miles per hour. The damage to this town, mostly to roofs, fences, windows, and shrubbery, was not very great, but considerable damage was done to crops in the country; at Ocklockonee, eight miles west of Tallahassee, two large lumber sheds and a mill were demolished; fences were blown down and corn broken off. Little River Bridge on the Mobile and Pensacola Railroad was partly undermined. In Jefferson county four houses were blown down and one man was killed.

Cedar Keys, Florida: during the afternoon of the 30th the wind blew hard from the east-northeast, and increased steadily in velocity until 10.30 p. m., when it veered to the east and attained the velocity of a high gale, and continued blowing with great energy during the night. The damage done by the storm was light, the display of cautionary signals causing the few vessels in harbor to take extra precautions. Some injury to roads was done by high tides, and one warehouse was blown from its foundation.

Appalachicola, Florida: a very heavy gale of almost hurricane force occurred here on the 30th. About 10 a. m. the wind commenced to blow a light gale from the southeast, and by 1 p. m. it had increased to seventy miles per hour; at 4.30 p. m. there was a lull in the storm and the wind suddenly changed from the southeast to the opposite direction, and blew with great force, unroofing houses, throwing down smoke-stacks, and destroying frame structures. The greatest damage was done to shipping in the bay; several vessels were capsized, some were sunk, and nearly every one in the harbor was more or less injured; several lives were lost. Along the river above Appalachicola large trees were blown down, corn broken off, and crops generally were greatly damaged.

Savannah, Georgia: during the afternoon and night of the 30th a very heavy gale and rain prevailed over southern Georgia. It was very destructive to corn and cotton crops and fencing throughout the country. The fol-

lowing note, relative to this storm, is from the "Georgia Crop Report" of July, 1886:

"A destructive wind storm, with heavy rain, occurred on the 30th of June in east and southwest Georgia, doing great damage to crops. The storm passed over Washington, Twiggs, Brooks, Thomas, and Dougherty counties, covering in its track the width of several counties in the extreme northwestern part of the state."

NORTH ATLANTIC STORMS DURING JUNE, 1886.

[*Pressure in inches and millimetres; wind-force by Beaufort scale.*]

The paths of the depressions that have appeared over the north Atlantic Ocean during the month are determined, approximately, from international simultaneous observations furnished by captains of ocean steamships and sailing vessels; abstracts of ships' logs and other data collected by the Signal Service agencies at the ports of New York, Boston, and Philadelphia; reports received through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs furnished by the proprietors of the "New York Maritime Register," and from other miscellaneous data received at this office up to June 20, 1886.

Of the fourteen depressions traced during the month, five, numbers 3, 5, 9, 13, and 14, are continuations of areas of low pressure traced on the North American continent; number 1 is a continuation of ocean depression number 10 charted for May, 1886; numbers 2, 4, 7, and 11 originated over the ocean east of the thirty-sixth meridian, and numbers 6, 8, 10, and 12 developed between the coast of North America and the forty-second meridian.

The following presents the characteristics of the depressions traced for the present month, as compared with those traced over the north Atlantic for June, 1885:

In June, 1885, six depressions appeared within the area covered by the observations; of this number, five were continuations of areas of low pressure originating over the North American continent. The general direction of movement of the depressions was east-northeasterly. With the exception of one depression, which passed south of Newfoundland during the 6th and 7th, the areas of low which passed over the ocean during June, 1885, were shallow.

In June, 1886, the general direction of movement of storm-tracks was east-northeasterly; the exceptions being numbers 2 and 4, which appeared east of the twenty-sixth meridian and first assumed a southeasterly course; number 10, which disappeared in a southeasterly direction, and number 12, which first moved slightly south of east. The depressions were, as a rule, of slight depth, and their passage was not accompanied by atmospheric disturbances of unusual violence. The very violent and destructive cyclones which passed to the westward of the West Indies and through the Gulf of Mexico are traced and described under the heading of "Areas of low pressure" in this REVIEW. The rate of progression of the depressions was, as a rule, rapid.

The month opened with an area of high pressure over mid-ocean. An area of low, central on the 1st over the British Isles, dominated the weather as far west as the thirty-fifth meridian; and light rains prevailed from the forty-third meridian to the coast of North America. The pressure continued high over mid-ocean until the 8th; from which date until the 12th stormy weather prevailed east of the fiftieth meridian and north of the fortieth parallel, attending the passage of depression number 5. During the 11th and 12th rains and gales were encountered over the entire ocean north of the fortieth parallel. From the 14th to 16th the pressure diminished rapidly over mid-ocean, and moderate to fresh gales were experienced between W. 30° and 50°. During the 15th and 16th the pressure was high in about N. 45°, W. 20°; this area moving slowly eastward to and over the British Isles during the next four days. From the 18th to 23d the weather was unsettled over mid-ocean and westward to the North American coast, and relatively low pressure and rain-areas continued west of the thirtieth meridian from the 26th to the close of the month.

The following are brief descriptions of the depressions charted:

1.—This storm was a continuation of depression number 10 traced for May, 1886, and moved northeastward from the northwest coast of Spain during the latter half of May 31st and the forenoon of June 1st. At noon (Greenwich mean time) of the 1st it was apparently central over England, with central pressure about 29.70 (754.4). Its influence was manifested over the ocean by moderate gales and rains as far west as the fifteenth meridian. During the 1st the centre of disturbance passed eastward beyond the region of marine observations.

2.—The development of this depression was indicated by reports of the 1st in about N. 50°, W. 25°. During this date the barometric gradient to the westward was very steep, and the centre of depression was forced southeastward to N. 47°, W. 12° by the 2d, with a slight decrease in central pressure, and fresh gales and rains to the west and northwest. During the next twenty-four hours the storm-centre moved east six degrees; disappearing to the eastward of the region of reports during the 3d.

3.—This depression was a continuation of low area number i, which first appeared over the North American continent, and passed off the coast of Labrador, in about N. 53°, during the early morning of the 4th. At 12 noon (Greenwich mean time) of the 4th the depression was apparently central in N. 54°, W. 50°, but an absence of reports renders it impossible to trace its subsequent course.

4.—This depression apparently advanced southeastward from the neighborhood of Greenland and was central on the 8th in N. 56°, W. 23°, with pressure ranging to about 29.60 (751.8); passing southeastward it was central on the 9th off the southwest coast of Ireland, with a slight increase in central pressure. Chief Officer J. Carson, of the s. s. "Palestine," Capt. W. Whiteway, commanding, makes the following report relative to this storm: "June 8th, in N. 51° 18′, W. 21° 37′, at night, moderate gale began from s., veering to wnw. in a. m. of 9th (position at noon N. 50° 53′, W. 26° 25′) and increased to strong wnw., with heavy squalls and high seas, moderating at night." Chief Officer Jos. Osienak, of the s. s. "Venetian," Captain Trant, commanding, reports having experienced in N. 50° 0′, W. 25° 0′, on the 9th, strong breezes to moderate gales from the w., with heavy and rough head seas. During the 9th this depression passed eastward of the limit of reports.

5.—This storm was a continuation of land depression number ii and passed eastward over Newfoundland during the 8th. At 12 noon (Greenwich mean time) of the 9th it was central in about N. 51°, W. 44°, with pressure about 29.60 (751.8); from this position it moved north of east to N. 54°, W. 29° by the 10th, with lower pressure, strong gales, and heavy rain. During the next twenty-four hours it passed northeastward to N. 59°, W. 17°, disappearing to the northeastward of the region of observation during the 11th, with lower pressure and evidence of great energy. This depression was accompanied by the severest storms of the month, and warning of its approach was cabled to London.

The following are reports received from vessels which came within its influence:

The s. s. "St. Laurent," Captain Baquesne, commanding, experienced a fresh gale on the 9th from the sw. Lowest barometer, 29.49 (479.0), at midnight of the 9th, in N. 49° 57′, W. 34° 04′; wind veered from sw. to w. as the disturbance progressed, and to wnw. following its passage. Capt. G. Moodie, commanding the s. s. "State of Georgia," reports "a fresh to strong gale on the 9th and 10th; lowest barometer, 29.39 (746.5), at 9.30 p. m. of the 9th, when in N. 51° 43′, W. 32° 46′. The gale set in from the se., shifting to sw. during, and to wsw. following, the passage of the disturbance. This storm was remarkable for the large amount of rain both before and after its passage, as well as for its force and duration for the season of the year; it seems to have extended fully half way across the Atlantic."

The s. s. "Pavonja," Capt. Bentley Woolfender, commanding, encountered a fresh gale on the 9th; lowest barometer, 29.91 (759.7), at 4 a. m., when in N. 42° 25′, W. 56° 0′. Gale set in from the sw., veering to nw. and accompanied by heavy rain.

Chief Officer W. Thompson, of the s. s. "Stockholm City," Capt. K. Doyle, commanding, under date of the 8th, reports: "In N. 43° 33′, W. 54° 32′, a fresh gale began from sw. at 6 p. m., with heavy rain; suddenly veered to nw. at midnight and moderated at 2 a. m., June 9th." The s. s. "Palestine," on June 10th, in N. 50° 16′, W. 31° 33′, had a moderate gale, w. in p. m., with squalls and rain, and on June 11th, experienced a fresh gale wsw. in early a. m., moderating at 4 a. m. Chief Officer D. Connor, of the s. s. "Scythia," Capt. T. Roberts, commanding, under date of the 11th, reports, "in N. 50° 30′, W. 22° 40′, strong breeze nw. and cloudy with hard squalls, increasing in p. m. to moderate gale nw. and fair; lowest barometer, 29.84 (757.9), at 4 a. m."

Chief Officer Galbraith, of the s. s. "Durham City," Capt. M. P. Lund, commanding, makes the following report "June 10th, in N. 51° 0′, W. 21° 54′, strong gale began in early a. m. from w., backing to s., with heavy rain and high sea; then veered to w. and continued all day; lowest barometer, 29.53 (750.0), at noon. June 11th, in N. 50° 36′, W. 25° 9′, heavy gale from w., with high seas in a. m.; moderated at times, and continued all day; lowest barometer, 29.58 (751.3), at 4 a. m."

6.—This depression apparently originated off the southern coast of Nova Scotia and was central on the morning of the 11th in N. 42°, W. 59°, with pressure about 29.70 (754.4), moderate gales and rain; from this position, circling northeastward, it is charted on the 12th in N. 48°, W. 46°, with pressure about one-tenth of an inch higher, and a marked loss of energy; during this date it disappeared to the northeastward. No special reports have been received relative to this storm, its lack of force scarcely justifying special mention.

7.—This depression first appeared in N. 54°, W. 20° on the 13th, with pressure about 29.60 (751.8), moderate gales and rain; thence passing northeastward to about N. 59°, W. 10° by the 14th, with lower pressure and marked increase in energy; strong gales and rain prevailed during this date off the west and northwest coasts of the British Isles and over the ocean north of the fiftieth parallel to W. 30°. During the 14th the centre of disturbance passed northeastward beyond the region of observation. No special reports have been received relative to this storm.

8.—This depression developed over mid-ocean and is first charted in N. 42°, W. 43° under date of the 14th, with central pressure about 29.50 (749.3), strong gales and rain; from this position it moved northeastward to N. 48°, W. 37° by the 15th, without marked changes in pressure; following a northeasterly course it was central on the 16th in N. 50°, W. 32°, with pressure about one-tenth of an inch higher, and a marked abatement of energy. During this date the depression apparently passed to the southeastward and filled up.

The following reports refer to this storm:

The s. s. "Holland," Capt. Wm. Tyson, commanding, "June 13th, at midnight, a whole gale from the s., veering to sw., w., nw., and n. by midnight of the 14th; lowest barometer, 29.50 (749.3), at 5 p. m. of the 14th, when in N. 42° 20′, W. 43° 15′. The s. s. "Edam," Capt. J. H. Taat, commanding, on the 14th and 15th had a strong gale; wind set in from s., veering to nnw. and ne., and backing to n., nw., and w., following the passage of the disturbance; barometer lowest at 6 p. m. of the 14th, when in N. 44° 20′, W. 43° 12′. The report further remarks that rough weather, from the sw. and w., was experienced during the entire passage, with continued high sea from w. and sw., and middling barometer; "no weather for this time of year."

The s. s. "Joseph Ferens," Capt. J. J. Mehegan, commanding, in N. 38° 47′, W. 43° 16′, on the 14th, had a moderate gale from ssw., with rough sea; wind veered to nw. on the 15th, and moderated; lowest barometer, 29.64 (752.8), at 7 p. m. Chief Officer Massam, of the s. s. "Galileo," Capt. R. Potter, commanding, reports: "June 14th, in N. 42° 15′, W. 42° 46′, a strong breeze from sw. in a. m., increasing at noon, with squalls, and at 4 p. m. to strong gale, when wind backed to s. for awhile, and then veered to sw., with heavy squalls and high seas; then veered to nw., and moderated at midnight. The barometer fell rapidly till 7 p. m., then began to rise." The s. s. "Durham City," in N. 47° 48′, W. 36° 40′, on the 14th, had light, variable winds in the early morning, veering at 9.30 a. m. from ese. to sw., and increasing to a whole gale, with high seas; wind backed to s. at night; lowest barometer, 29.76 (755.9), from noon to 8 p. m. June 15th, in N. 47° 10′, W. 38° 40′, at 4 a. m., the gale increased to storm force from s., with terrific squalls and furious seas; 10 a. m. wind veered to nw. and moderated in p. m.; barometer lowest at 4 a. m., then rising. 16th, in N. 45° 43′, W. 42° 53′, 4 a. m., wind west, with lightning and rain-squalls; clearing at noon.

The s. s. "Scythia," in N. 45° 37′, W. 41° 53′, on the 14th, had fresh n. veering to e. breeze, with heavy confused sea in a. m., increasing in p. m. to strong gale e., with violent squalls and heavy rain; 6.15 p. m., gale backed to ne. with heavy sea; lowest barometer, 29.67 (753.6), at 6 p. m. 15th, in N. 42° 32′, W. 48° 21′, moderate gales in a. m., from n., backing to nnw., and moderating at noon. The s. s. "Palestine," in N. 43° 02′, W. 47° 53′, on the 14th, experienced a fresh gale from ne., with squalls and rain, moderating in p. m. and backing to nw. Chief Officer A. Ferguson, of the s. s. "Waldensian," Capt. D. James, commanding, makes the following report: "June 15th, in N. 49° 26, W. 33° 14′, at noon, strong breeze from sw., with heavy sea in a. m., increasing at 4 p. m. to a fresh gale, with high seas; wind veered to w. and nw. and moderated at night; lowest barometer, 29.80 (756.9), at noon. 16th, in N. 47° 27′, W. 37° 08′, at noon, moderate to strong nw. to sw. breeze, and squally, with heavy showers." Chief Officer Strickland, of the s. s. "Harrogate," Captain Surtees, commanding, submits the following data: "June 14th, in N. 44° 45′, W. 38° 20′ (at noon); 4 p. m., a fresh gale began from sw., backing to s., and at 9.30 p. m. increased to strong gale, with heavy squalls and rain and very high sea; then veered to sw. in a. m. of 15th, in N. 43° 50′, W. 40° 40′, (at noon), blowing very hard; then veered to nw. and moderated at noon." Capt. John Harrison, commanding the s. s. "Assyrian Monarch," reports: "June 14th, encountered a strong gale ne., changing to e., to ne., to n. and nw., and to w., on the 15th, following the passage of the disturbance; barometer lowest at 2.30 p. m. (Greenwich mean time) of the 14th; winds before the disturbance were very unsteady, coming from all points of the compass and in violent gusts." The s. s. "Adriatic," Capt. H. Parsell, commanding, in N. 43° 30′, W. 47° 15′, at 6 p. m., had barometer 29.58 (751.3); "greatest force of wind and lowest barometer, 11 a. m.; wind force 9, after which the gale gradually moderated."

9.—This depression was a continuation of land storm number v, and passed off the coast of Newfoundland, in N. 51° 30′, on the 19th. At 12 noon (Greenwich mean time) of that date it was central in N. 51° 30′, W. 50°, with pressure about 29.50 (749.3), from thence passing eastward beyond the region of observation. No special reports have been received relative to this storm, as it passed to the northward of the track of trans-Atlantic vessels.

10.—This storm developed in about N. 38°, W. 68° on the 19th and moved north of east to N. 41°, W. 56° by the 20th, thence passing southeastward to N. 36°, W. 50° by the 21st, during which date it disappeared to the southeastward. The depression was shallow, but was accompanied by fresh gales and rain throughout its course. The following special reports were made relative to this storm: Mate Chas. McClure, of the bark "Martha Davis," Capt. T. M. Benson, commanding, "June 19th, in N. 38° 55′, W. 69° 55′, 3.30 p. m., fresh gale began from n.; veered to ne., with squalls, and moderated on morning of 20th; no barometer readings recorded." Capt. J. T. Satterly, commanding the s. s. "Endymion," "June 20th, at

noon, in N. 34° 19′, W. 60° 38′, fresh gale commenced from sw., veering to nw. during, and becoming variable following, the passage of the disturbance."

11.—Apparently originating in about N. 38°, W. 35° on the 21st this depression passed north of east to N. 40°, W. 30° by the 22d, disappearing during that date to the northeastward. The storm was attended by fresh gales and rain over the Azores and over the ocean between W. 20° to 40°, and N. 30° to 45°. No special reports have been received.

12.—This depression first appeared in N. 37°, W. 58° on the 22d, with fresh gales and rains to the west and northwest; from this position, passing northeastward, the storm was central on the 23d in N. 41°, W. 52°, with pressure about 29.60 (751.8), moderate to strong gales and rain; during the next twenty-four hours it moved southeast to N. 39°, W. 49°, with increasing pressure and loss of energy; thence passing slightly north of east to N. 40°, W. 41° by the 25th, with a further increase in pressure and rain to the northward. From this location the depression moved northeastward to N. 44°, W. 35° by the 26th, with slight changes in pressure, moderate gales, and rain; continuing a northeasterly course it was central on the 27th in N. 49°, W. 27°, during which date it apparently passed northward and filled up.

Capt. F. H. Storm, commanding the s. s. "Prinz Fredrich Carl," makes the following report: "22d, in N. 39° 57′, W. 62° 32′, gale commenced from nw., veering to wnw. 4 p. m., blowing a moderate gale from nw.; barometer 29.99 (761.7); increasing at 6 p. m.; barometer 29.82 (751.4); heavy sea from nw.; dark clouds rising from w. to nw. 8 p. m., strong gale; wind north; barometer 29.79 (756.7); very heavy sea; shipped a great deal of water. 10 p. m., barometer 29.76 (755.9); wind nnw.; strong gale; heavy sea. 11 p. m., barometer 29.77 (756.1); strong gale; decreasing by midnight. Gale ended 12 noon of the 23d, in N. 40° 9′, W. 59° 55′; lowest barometer during the gale at 10 p. m. 22d, when in N. 40° 0′, W. 61° 50′." Capt. Frederick Graham, commanding the s. s. "Biela," reports: "24th, in N. 39° 45′, W. 49° 57′, 4 a. m., wind easterly, with terrific squalls, thunder and lightning, and heavy rain. Noon, weather more clear; wind ne., fresh. 4 p. m., wind falling light; clearing; barometer, 29.85 (758.2), steady. Lowest barometer during storm, 29.65 (753.1)."

13.—This storm continued land depression number viii which passed off the coast of the United States in N. 39° 30′ during the 23d. Passing nearly due east the depression was apparently central on the 24th in N. 40°, W. 60°, with slight evidence of energy, whence it dissipated to the eastward.

14.—Continuing land depression number ix this storm passed north of east over the Avalon Peninsula during the 27th, and was central on the 28th in N. 48°, W. 50°, with moderate gales and rain; pursuing a course north of east it is traced to N. 51°, W. 36° on the 29th, and to N. 52°, W. 26° on the 30th, with decreasing pressure. No special reports have been received relative to this depression. Strong gales, resulting from the passage of land depression number x off the south coast of Newfoundland on the 30th, were experienced by vessels in that vicinity.

OCEAN ICE.

On chart i are also exhibited the eastern and southern limits of the region within which icebergs and field ice have been observed during June, 1886. These limits have been determined from reports furnished by shipmasters, and from trustworthy data published in the "New York Maritime Register" and other newspapers. During this month the easternmost icebergs were observed on the 9th, in N. 49° 15′, W. 40°, by the bark "Louise." Isolated bergs were also encountered in N. 42° 30′, W. 43′, and in N. 40° 30′, W. 53°, the latter being the southernmost reported. From N. 42° 30′, W. 50°, and N. 46°, W. 46°, northwestward, icebergs were very numerous. Exceptionally large movements of ice on the Grand Banks were reported at the commencement of the month, and dense fogs were encountered as far south as the forty-second parallel during the latter portion. The southern movement of ice massed to the northward of Newfoundland and off the coast of Labrador has been exceptionally late—no vessels having passed through the Straits of Belle Isle until after the middle of the month. A comparison with the chart of the preceding month (May, 1886) shows the southern and eastern limits of the region within which ice was reported to be about the same, although during June isolated icebergs were observed six degrees further east and one degree further south than in May. As compared with June, 1885, the extreme eastern limit is extended about one degree and the southern limit is about one degree further north.

The following table shows the comparison between June, 1886, and the same month of the three preceding years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Lon. W.	Month.	Lat. N.	Lon. W.
	° ′	° ′		° ′	° ′
June, 1883	40 28	51 45	June, 1883	48 14	42 43
June, 1884	40 42	47 49	June, 1884	44 00	45 23
June, 1885	39 38	48 12	June, 1885	45 14	41 12
June, 1886	40 30	53 0		42 30	41 20
			June, 1886	44 31	41 35
				49 15	40 00

The following reports were made relative to icebergs and field ice observed during June, 1886:

Thomas Kirby, commanding s. s. "Mathew Bedlington," "May 31st, 7 a. m., in N. 52° 0′, W. 52° 30′, was stopped all night by dense fog; fog lifted a little and we saw an enormous quantity of field ice and bergs, closely packed, to the westward. The ship's course was then altered to the northward, in which direction we steamed about forty-five miles, but no possible chance was seen to get through to the westward. The further north we went the closer it was packed and the larger the bergs. The ship's head was then put to the se., and we gave up the attempt to enter by way of the Straits of Belle Isle. The southern edge of this massive drift we never saw, owing to the fog. It continued foggy until June 3, during which time, whenever the fog lifted, icebergs were seen. On the morning of the 3d the fog lifted a little and we counted no less than seventy icebergs at one time; the ship was surrounded by them, our position being about twenty miles ese. from Cape Race; from this point until we got past Miquelon Islands we could see bergs in all directions, and found it difficult to avoid them."

5th.—The s. s. "Wisconsin," in N. 43° 20′, W. 49° 21′, at 1.30 p. m., passed two icebergs; dense fog prevailing. The s. s. "Critic," in N. 46° 33′, W. 51° 51′, at 10.30 a. m., sighted a moderate sized iceberg about four miles to the north; also saw an iceberg the same afternoon south of the ship.

7th.—The s. s. "Ontario" passed several large icebergs twenty-five miles east of Cape Race; 6 p. m., in N. 47° 28′, W. 48° 54′, passed eight icebergs, four of them being large ones.

8th.—The s. s. "Ontario," in N. 47° 54′, W. 47° 2′, at 2 a. m., passed a large iceberg.

9th.—The bark "Louise," in N. 49° 15′, W. 40°, passed six very large icebergs. The s. s. "St. Laurent" passed icebergs from N. 46° 55′, W. 51° 48′, to N. 46° 50′, to W. 52° 35′.

10th.—The s. s. "Etruria," in N. 42° 46′, W. 50° 6′, passed a large iceberg. The bark "Louise" passed within a ship's length, during thick fog, a berg so high that the top could not be seen.

11th.—The ship "Theo Fischer," in N. 42°, W. 43°, passed an iceberg. The bark "Louise," in N. 48° 30′, W. 46° 30′, passed five immense icebergs.

12th.—The brig "St. Joseph," arrived at Saint John's, Newfoundland, on this date and reported some three hundred icebergs east of the Grand Banks, and as low down as the forty-fourth parallel. The s. s. "St. Laurient" passed twenty-two icebergs.

14th.—The s. s. "Buenos Ayrean," in N. 46° 28′, W. 47° 21′, 3 p. m., passed an iceberg, ssw., eight miles; 3.20 p. m., passed a berg, nne., ten miles. The s. s. "Venetian," in N. 43° 07′, W. 49° 55′, passed a medium-sized iceberg.

20th.—The s. s. "Thingvalla," in N. 44° 45′, W. 48° 10′, passed an iceberg. The ship "Ferdinand," in N. 46°, W. 46°, passed two large icebergs and several small ones.

22d.—The s. s. "Nant Gwynant," in N. 43° 30′, W. 50° 10′, passed a large iceberg. The steamers "Carmona" and "Concordia" arrived at Montreal this date, and were the first vessels to pass through the Straits of Belle Isle this season. The "Carmona" reported fields of small broken ice east of Belle Isle, and saw many icebergs. The "Concordia" met a considerable quantity of detached ice, much broken up, one hundred and ten miles east of Belle Isle; also a great number of very large icebergs ninety miles off Belle Isle, and about ten miles south of the track; between Belle Isle and Labrador coast counted ten large bergs. The brig "Eugenia," at Saint John's, Newfoundland, reported some thirty icebergs bearing from sw. to se., off Cape Race.

23d.—The s. s. "Wodam," in N. 40° 44′, W. 53°, passed three large icebergs.

24th.—The s. s. "La Bourgogne," in N. 43° 14′, W. 48° 29′, at 9.25 a. m., passed a large iceberg.

26th.—The bark "Bristol," in N. 46° 25′, W. 53° 30′, passed three large icebergs.

28th.—The s. s. "Corean," in N. 46° 39′, W. 47° 08′, passed a large iceberg and a number of small ones.

29th.—The ship "Ferdinand," in N. 47° 41′, W. 49° 45′, passed an iceberg; also passed two icebergs in N. 47° 49′, W. 49° 24′, and one large berg in N. 48° 19′, W. 47° 46′. The s. s. "Lydian Monarch," in N. 48° 20′ and from W. 48° to 49°, passed four icebergs.

30th.—The s. s. "Egypt," in N. 44° 24′, W. 49° 12′, at 12.30 a. m., passed two large icebergs. The s. s. "Adriatic," in N. 43° 30′, W. 49° 45′, passed an iceberg at 10 p. m. The s. s. "Ferdinand," in N. 44° 24′, W. 49° 12′, passed two icebergs.

SIGNAL SERVICE AGENCIES.

Signal Service agencies have been established in the Maritime Exchange buildings at New York City and Philadelphia, and in the Custom-House, Boston, where the necessary blanks and other information will be furnished to ship-masters.

In pursuance of arrangements made with the Meteorological Office of London, England, there were cabled to that office from New York during June, 1886, three reports concerning storms and icebergs encountered by vessels in the Atlantic west of the forty-fifth meridian; two messages were sent from Boston.

TEMPERATURE OF THE AIR.

[*Expressed in degrees, Fahrenheit.*]

The distribution of mean temperature over the United States and Canada for June, 1886, is exhibited on chart ii by the dotted isothermal lines; and in the tables of miscellaneous data are given the monthly mean temperatures, with the departures from the normal, for the various stations of the Signal Service. On chart iv the departures from the normal temperature are illustrated by lines connecting stations of normal or equal abnormal values.

The following are some of the most marked departures from the normal temperature at Signal Service stations:

Above normal.	°	Below normal.	°
Red Bluff, California	3.3	Phœnix, Arizona	4.8
Fort Benton, Montana	2.6	Nashville, Tennessee	4.6
Fort Apache, Arizona	2.5	New Haven, Connecticut	4.4
Fort Buford, Dakota	2.2	Norfolk, Virginia	4.2
Fort Assiniboine, Montana	1.9	Cincinnati, Ohio	4.2
Bismarck, Dakota	1.7	Baltimore, Maryland	4.0
Fort Maginnis, Montana	1.5	Lynchburg, Virginia	3.9
Fort Shaw, Montana	1.5	Charlotte, North Carolina	3.7

During June, the mean temperature in Arizona and the whole of the large area of country extending from the Atlantic Ocean westward to the Rocky Mountains, with the exception of Montana, Dakota, eastern Iowa, northern Illinois, and Florida, was below the normal, the most marked departures occurring in the middle Atlantic states and Ohio Valley, these districts being about 3°.5 colder than the average June. In the Rocky Mountain regions, the Pacific slope, Montana, Dakota, and Florida the temperature for the month has been above the normal, but the excess has nowhere been very great.

DEVIATIONS FROM NORMAL TEMPERATURES.

In the table below are given, for certain stations, as reported by voluntary observers, the normal temperatures for June for a series of years, the mean temperature for June, 1886, and the departures from the normal:

Station.	County.	Normal temperature for June.	Number of years.	Mean temperature for June, 1886.	Departure.
		°		°	°
Arkansas.					
Lead Hill	Boone	77.3	4	75.4	− 1.9
California.					
Sacramento	Sacramento	70.5	20	72.3	+ 1.8
Connecticut.					
Middletown *	Middlesex	66.1	28	63.4	− 2.7
New Haven *	New Haven	67.0	100	63.1	− 3.9
Thompson *	Windham	65.0	30	63.4	− 1.6
Dakota.					
Webster	Day	71.4	4	68.9	− 2.5
Illinois.					
Anna	Union	74.4	11	73.7	− 0.7
Mattoon	Coles	72.4	6	73.0	+ 0.6
Peoria	Peoria	73.3	30	74.2	+ 0.9
Riley	McHenry	66.4	25	65.5	− 0.9
Sycamore	De Kalb	66.9	5	66.2	− 0.7
Indiana.					
Lafayette	Tippecanoe	69.8	7	68.9	− 0.9
Logansport	Cass	73.9	31	72.2	− 1.7
Manzy	Rush	68.8	7	66.9	− 1.9
Spiceland	Henry	70.5	32	67.5	− 3.0
Vevay	Switzerland	74.1	21	70.5	− 3.6
Iowa.					
Monticello	Jones	68.3	33	68.9	+ 0.6
Kansas.					
Independence	Montgomery	74.7	15	72.9	− 1.8
Lawrence	Douglas	73.1	18	71.8	− 1.3
Wellington	Sumner	73.6	8	71.2	− 2.4
Yates Centre	Woodson	73.1	6	70.4	− 2.7
Maine.					
Belfast *	Waldo	61.3	27	60.1	− 1.2
Bridgeton *	Cumberland	62.8	11	61.3	− 1.5
Cornish	York	64.9	29	62.9	− 2.0
Gardiner	Kennebec	63.4	50	61.1	− 2.3
Orono *	Penobscot	62.3	18	61.6	− 0.7
Maryland.					
Fallston	Harford	70.4	15	66.8	− 3.6
Massachusetts.					
Amherst *	Hampshire	66.0	49	64.4	− 1.6
Cambridge *	Middlesex	66.7	64	63.7	− 3.0
Fitchburg *	Worcester	65.6	30	63.5	− 2.1
New Bedford *	Bristol	64.1	74	62.8	− 1.3
Somerset	Bristol	69.2	16	67.6	− 1.6
Springfield *	Hampden	68.6	19	66.4	− 2.2
Taunton	Bristol	68.7	16	64.0	− 4.7
Williamstown *	Berkshire	65.9	34	62.3	− 3.6
Worcester *	Worcester	66.1	47	61.4	− 4.7
Nevada.					
Carson City	Ormsby	64.8	7	67.3	+ 2.5
New Brunswick.					
Saint John *	Saint John	55.2	26	57.3	+ 2.1
New Hampshire.					
Concord *	Merrimac	64.7	18	62.1	− 2.6
Hanover *	Grafton	65.5	26	63.4	− 2.1
New Jersey.					
South Orange	Essex	69.4	16	65.4	− 4.0
New York.					
Factoryville	Tioga	65.1	4	65.1	0.0
North Volney	Oswego	64.9	18	63.3	− 1.6
Palermo	Oswego	65.6	33	61.7	− 3.9
Plattsburg Barracks	Clinton	65.4	17	63.2	− 2.2
Ohio.					
Wauseon	Fulton	68.4	16	67.4	− 1.0
Westerville	Franklin	67.8	11	66.4	− 1.4
Pennsylvania.					
Dyberry	Wayne	64.5	20	62.4	− 2.1
South Carolina.					
Stateburg	Sumter	76.3	6	75.0	− 1.3
Texas.					
New Ulm	Austin	80.6	14	81.7	+ 1.1
Vermont.					
Lunenburg *	Essex	64.2	38	59.9	− 4.3
Newport *	Orleans	65.2	12	62.9	− 2.3
Strafford *	Orange	65.2	12	63.9	− 1.3
Virginia.					
Bird's Nest	Northampton	74.4	18	74.4	0.0
Dale Enterprise	Rockingham	70.4	6	72.3	+ 1.9
Variety Mills	Nelson	71.1	9	69.5	− 1.6
Wytheville	Wythe	68.1	23	67.4	− 0.7
West Virginia.					
Helvetia	Randolph	66.2	10	65.1	− 1.1

* From the "Bulletin of the New England Meteorological Society."

In connection with this subject, the following notes are furnished by voluntary observers:

Illinois.—Riley, McHenry county: during the past thirty years the warmest

June occurred in 1873, mean temperature, 79°.0; the coldest June in 1869, mean temperature, 68°.8; the maximum June temperature during that period, 100°.0, occurred in 1856; minimum, 41°.0, in 1860.

Indiana.—Vevay, Switzerland county: the highest temperature that has occurred in any June during the past twenty-one years was 99°.0, in 1866 and 1867; and the lowest, 46°.0, in 1878.

Lafayette, Tippecanoe county: the maximum temperature for June, 1886, 92°.8, is 1°.4 above the average of the past seven years; the minimum, 39°.0, is 6°.4 below the average June minimum.

Iowa—Monticello, Jones county: the highest temperature that has occurred in any June during the past thirty-three years was 102°.0, in 1856 and 1870; the lowest, 36°.0, in 1855; the warmest June during the same period occurred in 1856, mean temperature, 74°.0; the coldest in 1863, mean temperature, 64°.1.

Kansas.—Wellington, Sumner county: the mean temperature of June, 1886, was lower than the mean for any June during the past eight years; the warmest June during this time was 78°.4, in 1881; the highest temperature occurred in 1879, 99°.0; the lowest, also in 1879, 37°.0.

Independence, Montgomery county: the mean temperature of the first six months of this year, 49°.1, is 2°.0 below the average of similar periods during the past fifteen years.

Maine.—Cornish, York county: the mean temperature of June, 1864, 69°.3, is higher than any June mean temperature during the past twenty-nine years; the mean temperature of June, 1857, 59°.1, is the lowest.

Maryland.—Fallston, Harford county: the highest mean temperature for June during the past fifteen years was 72°.6, in 1874; the lowest, 66°.8, in 1886.

Massachusetts.—Taunton, Bristol county: the mean temperature of the present June, 64°.0, is lower than the mean of any June during the past sixteen years.

New York.—Palermo, Oswego county: the highest mean temperature for June during the past thirty-three years was 71°.6, in 1870; the lowest, 59°.4, in 1855.

North Volney, Oswego county: the highest mean temperature for June during the past eighteen years was 71°.6, in 1870; the lowest, 58°.7, in 1881.

Ohio.—Westerville, Franklin county: the highest mean temperature for June during the past eleven years occurred in 1880 and 1884, 69°.9; the lowest, in 1878, 64°.4.

Wauseon, Fulton county: the warmest June during the past sixteen years was in 1873, mean temperature, 72°.4; the coldest was in 1881, mean, 65°.5; the maximum June temperature during the same period occurred in 1874, 99°.0; the minimum, in 1883, 34°.5.

Texas.—New Ulm, Austin county: the highest mean temperature for June during the past fourteen years was 85°.0, in 1881, the lowest, 72°.3, in 1877; the maximum June temperature during the same period occurred in 1881, 102°.0; the minimum in 1877, 55°.0.

Virginia.—Variety Mills, Nelson county: during the past nine years the warmest June occurred in 1877, mean temperature, 73°.3; the coldest in 1878, mean, 67°.5.

Dale Enterprise, Rockingham county: during the past six years the warmest June occurred in 1881, mean temperature, 76°.6; the coldest in 1883, mean, 63°.8.

In the following table are given the mean temperatures for the several geographical districts, with the normals and departures, as deduced from Signal Service observations:

Average temperatures for June.

Districts.	Average for June Signal-Service observations.		Comparison of June, 1886, with the average for several years.
	For several years.	For 1886.	
	°	°	°
New England	64.3	61.7	— 2.6
Middle Atlantic States	71.3	68.3	— 3.0
South Atlantic States	76.9	75.3	— 1.6
Florida Peninsula	80.8	81.3	+ 0.5
Eastern Gulf States	78.8	76.4	— 2.4
Western Gulf States	80.1	77.8	— 2.3
Rio Grande Valley	84.1	82.0	— 2.1
Tennessee	75.9	72.7	— 3.2
Ohio Valley	72.5	69.2	— 3.3
Lower Lake region	66.3	64.5	— 1.8
Upper Lake region	61.3	60.1	— 1.2
Extreme Northwest	61 8	62.8	+ 1.0
Upper Mississippi Valley	71.3	70.6	— 0.7
Missouri Valley	70.0	68.6	— 1.4
Northern slope	61.8	62.5	+ 0.7
Middle slope	70.4	69.6	— 0.8
Southern slope	76.1	75.2	— 0.9
Southern plateau	75.4	74.1	— 1.3
Middle plateau	65.4	66.4	+ 1.0
Northern plateau			
North Pacific coast region	60.6	61.4	+ 0.8
Middle Pacific coast region	67.6	68.7	+ 1.1
South Pacific coast region	71.8	71.1	— 0.7

RANGES OF TEMPERATURE.

The monthly, and the greatest and least daily, ranges of temperature are given in the table of miscellaneous meteorological data.

The following are some of the greatest and least monthly ranges at Signal Service stations:

Greatest.		Least.	
	°		°
Fort McDowell, Arizona	68.0	Cape Mendocino, California	18.4
Poplar River, Montana	64.7	San Diego, California	20.5
Fort Apache, Arizona	60.6	New Orleans, Louisiana	22.0
Winnemucca, Nevada	59.6	Astoria, Oregon	22.0
Willcox, Arizona	57.5	Galveston, Texas	22.8
Fort Buford, Dakota	57.5	Charleston, South Carolina	22.8
Saint Vincent, Minnesota	57.2	Fort Macon, North Carolina	23.5
Fort Shaw, Montana	57.1	Cedar Keys, Florida	23.7

Table of comparative maximum and minimum temperatures for June.

State or Territory.	Station.	For 1886.		Since establishment of station.			
		Max.	Min.	Max.	Year.	Min.	Year.
		°	°	°		°	
Alabama	Mobile	93.6	65.4	100.0	1877, 1882	61.0	1879
Do	Montgomery	95.0	63.9	105.5	1881	58.0	1877, 1879
Arizona	Prescott	93.1	42.0	102.0	1878	32.0	1880
Do	Fort Apache	100.6	40.0	101.0	1883	33.3	1885
Arkansas	Fort Smith	98.9	59.2	101.0	1882	50.0	1882
Do	Little Rock	95.2	60.2	98.0	1882	55.0	1882
California	San Francisco	82.8	48.3	95.2	1883	48.0	1871, 1874
Do	San Diego	74.8	54.3	94.0	1877	50.0	1884
Colorado	Denver	92.7	46.8	99.0	1873	37.0	1883
Do	Pike's Peak	52.1	24.0	63.0	1881	2.0	1882
Connecticut	New Haven	80.5	46.4	92.0	1880, 1884	41.4	1884
Do	New London	77.7	46.7	89.0	1880	43.0	1876, 1884
Dakota	Fort Buford	93.7	36.2	107.0	1883	30.0	1883
Do	Yankton	90.5	44.2	97.0	1876	38.0	1876'77'79
Delaware	Del. Breakwater			89.0	1880	50.0	1882
District of Columbia	Washington City	88.8	50.2	102.5	1874	46.5	1873
Florida	Jacksonville	94.3	66.9	100.5	1880	61.7	1884
Do	Key West	99.8	73.6	95.5	1881	71.2	1882
Georgia	Atlanta	89.7	60.0	94.8	1881	54.0	1879
Do	Savannah	93.2	66.5	100.0	1880	54.0	1885
Idaho	Boisé City	95.8	39.5	98.6	1885	36.0	1882
Illinois	Cairo	88.4	55.5	96.0	1872	50.0	1877
Do	Chicago	87.3	49.0	98.0	1872	40.0	1875
Indiana	Indianapolis	89.0	46.9	96.0	1874	41.1	1885
Indian Territory	Fort Sill	103.0	51.7	105.0	1881	47.0	1879
Iowa	Dubuque			98.0	1874	40.0	1877
Do	Keokuk	88.8	46.1	96.0	1873	45.0	1877
Kansas	Dodge City	95.2	47.2	102.0	1880	40.0	1879
Do	Leavenworth	92.0	54.2	99.0	1875	45.0	1877, 1882
Kentucky	Louisville	89.3	52.1	100.0	1874	50.0	1882
Louisiana	New Orleans	92.0	70.0	97.0	1881	65.0	1879
Do	Shreveport	100.7	63.9	104.0	1875	55.0	1877
Maine	Eastport	75.9	41.3	82.0	1874	30.0	1875
Do	Portland	82.1	47.0	94.0	1878	43.0	1875
Maryland	Baltimore	89.0	51.8	97.5	1874	49.0	1873
Massachusetts	Boston	81.7	50.1	98.0	1874	42.0	1884
Michigan	Detroit	89.2	49.0	93.0	1874	38.0	1875
Do	Alpena	84.3	41.1	97.0	1874	33.5	1881
Minnesota	Duluth	87.5	38.9	92.2	1883	33.3	1885
Do	Saint Paul	90.7	42.8	94.0	1874	36.0	1885
Mississippi	Vicksburg	93.1	65.8	101.0	1881	53.0	1879
Missouri	Saint Louis	90.8	57.0	99.0	1881	46.0	1877
Montana	Fort Benton	95.7	38.6	101.0	1881	27.0	1881
Do	Helena	88.3	40.0	95.0	1880	31.0	1880
Nebraska	North Platte	90.0	50.3	101.0	1876	33.0	1876
Do	Omaha	92.4	47.1	98.0	1881	42.0	1877
Nevada	Winnemucca	94.9	35.3	95.0	1881	30.8	1885
New Hampshire	Mount Washington	58.2	24.1	71.0	1878	15.0	1878, 1879
New Jersey	Atlantic City	82.0	50.3	93.0	'74,'80,'81	45.0	1878
Do	Sandy Hook	82.0	52.9	97.0	1874	49.0	1874
New Mexico	Santa Fé	85.9	43.8	92.0	1881	33.0	1877, 1880
New York	Buffalo	84.6	46.2	92.0	1878	40.5	1879
Do	New York City	83.0	53.0	95.0	1875	47.0	1878, 1879
North Carolina	Charlotte	89.7	56.6	97.0	1881	31.5	1884
Do	Wilmington	92.2	56.3	100.0	1880	51.0	1884
Ohio	Cincinnati	85.5	50.7	98.5	1874	48.1	1885
Do	Cleveland	90.2	44.2	96.0	1874	40.0	1879
Oregon	Portland	95.0	46.5	99.0	1876	39.0	1875
Do	Roseburg	86.8	44.3	96.5	1878	37.5	1880
Pennsylvania	Pittsburg	92.5	45.2	98.0	1874	39.0	1879
Do	Philadelphia	86.0	53.6	97.0	1874	47.2	1884
Rhode Island	Block Island	74.1	47.6	82.6	1884	46.2	1884
South Carolina	Charleston	89.5	66.7	100.0	1877, 1880	58.2	1884
Tennessee	Knoxville	91.2	55.0	96.0	1880	47.0	1878
Do	Nashville	91.1	55.6	99.0	1874	49.0	1877
Texas	Fort Davis	99.5	49.5	111.0	1881	49.0	1881
Do	Galveston	90.0	67.2	97.0	1875	64.0	1877, 1879
Utah	Salt Lake City	95.2	42.2	100.0	1883	37.0	1875
Virginia	Lynchburg	88.3	52.4	97.0	1874	49.0	1880
Do	Norfolk	93.2	56.5	102.0	1874	53.0	1876, 1884
Washington Ter.	Spokane Falls			94.5	1882	39.0	1882
Do	Olympia	91.9	36.2	95.0	1878	36.0	1880
Wisconsin	La Crosse	94.0	47.3	98.0	1874	40.0	1876
Do	Milwaukee	86.0	42.4	94.0	1872, 1874	39.8	1885
Wyoming	Cheyenne	88.8	39.9	97.0	1880, 1881	28.0	1876

FROSTS.

Frosts occurred in the various states and territories during the month on the following dates:

Colorado.—Pike's Peak, 1st, 5th, 17th.

Connecticut.—New Haven, 1st.

Dakota.—Fort Buford, 2d; Fort Pembina, 5th; Fort Totten, 7th.

Idaho.—Boisé City, 11th.

Illinois.—Sycamore, 3d; Chicago, 8th.

Iowa.—Monticello, Manchester, Cedar Rapids, West Union, and Corydon, 3d.

Michigan.—Escanaba, 3d, 5th to 8th, 18th; Hudson, 4th; Mackinaw City, 4th, 6th, 8th; Alpena, 6th; Pentwater, 8th; Grand Haven, 18th; Port Huron, 19th; Marquette, 28th.

Minnesota.—Moorhead, 2d, 3d, 5th, 6th; Saint Vincent, 4th, 5th, 7th; Duluth, 8th.

Montana.—Fort Shaw and Poplar River, 2d.

Nevada.—Winnemucca, 14th, 15th.

New Hampshire.—Mount Washington, 4th, 5th, 6th, 20th, 30th.

New York.—North Volney, 1st, 19th; Factoryville, 4th; Humphrey, 4th, 8th, 19th.

Ohio.—Westerville, Wauseon, and Garrettsville, 4th; Napoleon, 4th, 18th.

Pennsylvania.—Pisgah Mountain, near Troy, 1st, 3d; East Brook and Pittsburg, 4th; Wellsborough, 4th, 5th, 19th, 28th; Grampian Hills, 4th, 19th; Erie, 8th; Dyberry and Philipsburg, 19th.

Vermont.—Strafford, 2d, 4th, 19th, 20th.

Wisconsin.—Fond du Lac, 2d; Neillsville, 3d; Milwaukee, 8th.

Wyoming.—Fort Bridger, 14th.

The following reports of injury to vegetation by frosts have been reported:

Poplar River, Montana: vegetation was seriously injured by a heavy frost on the morning of the 2d.

Saint Vincent, Kittson county, Minnesota: a heavy frost occurred during the night of the 4–5th, which cut down most of the wheat in this county and in the northwestern townships of Pembina county, Dakota. Reports from farmers in this vicinity and along the line of the Saint Paul, Minneapolis, and Manitoba Railroad state that wheat had turned red and was lying on the ground, having been wilted by the frost. Market gardeners also suffered considerable damage.

Contoocook, Merrimac county, New Hampshire: the crops in the lowlands were killed by a heavy frost on the morning of the 19th.

PRECIPITATION.

[*Expressed in inches and hundredths.*]

The distribution of rainfall over the United States and Canada for June, 1886, as determined from the reports of about seven hundred stations, is exhibited on chart iii.

The precipitation for the month has been very unequally distributed over the country, the excess of rainfall being very large in some districts, and the deficiency in other districts being correspondingly great. In the Atlantic States south of Pennsylvania, the Gulf States, including only the extreme eastern portion of Texas, the Alleghany Mountain region, Tennessee, and in the Ohio Valley the rainfall was largely in excess of the normal. The excess was especially great in South Carolina, Georgia, northern Florida, Alabama, Mississippi, Louisiana, and Tennessee, averaging one hundred per cent. above the normal rainfall of those states. In New England, New York, Pennsylvania, the Lake regions, upper Mississippi valley, southern Florida, and over the large area of country extending westward from the ninety-fifth meridian to the Pacific Ocean the rainfall was below the normal, very large deficiencies and severe drought occurring in the Missouri and upper Mississippi valleys, the extreme northwest, and Texas.

In the following table are shown, for the several geographical districts, the normal precipitation for June; the average for June, 1886, and the excess or deficiency as compared with the normal:

Average precipitation for June.

Districts.	Average for June, Signal-Service observations.		Comparison of June, 1886, with the average for several years.
	For several years.	For 1886.	
	Inches.	*Inches.*	*Inches.*
New England	3.60	1.97	−1.63
Middle Atlantic States	3.63	4.41	+0.78
South Atlantic States	4.99	7.79	+2.80
Florida Peninsula	6.19	6.54	+0.35
Eastern Gulf States	4.89	8.24	+3.35
Western Gulf States	4.11	5.95	+1.84
Rio Grande Valley	1.46	4.93	+3.47
Tennessee	4.54	7.05	+2.51
Ohio Valley	4.42	4.68	+0.26
Lower lake region	3.88	2.18	−1.70
Upper lake region	4.18	2.69	−1.49
Extreme northwest	3.41	2.50	−0.91
Upper Mississippi Valley	5.60	3.63	−1.97
Missouri Valley	5.42	2.85	−2.57
Northern slope	2.54	1.52	−1.02
Middle slope	3.86	3.33	−0.53
Southern slope	3.83	1.63	−2.20
Southern plateau	0.46	0.31	−0.15
Middle plateau	0.92	0.89	−0.03
Northern plateau			
North Pacific coast region	1.34	0.69	−0.65
Middle Pacific coast region	0.34	0.00	−0.34
South Pacific coast region	0.09	0.06	−0.03

The following are some of the most marked departures from the normal precipitation at Signal Service stations:

Above normal.		Below normal.	
	Inches.		*Inches.*
Charlotte, North Carolina	6.93	Des Moines, Iowa	6.70
Brownsville, Texas	6.00	Palestine, Texas	6.07
Little Rock, Arkansas	5.98	Omaha, Nebraska	4.90
Vicksburg, Mississippi	5.89	Fort Sill, Indian Territory	4.33
Augusta, Georgia	5.59	Fort Reno, Indian Territory	4.33
Charleston, South Carolina	5.43	Cleveland, Ohio	3.44
Lynchburg, Virginia	5.03	Chicago, Illinois	3.40
Atlanta, Georgia	4.35	Port Huron, Michigan	2.99
Kitty Hawk, North Carolina	4.30	La Crosse, Wisconsin	2.85

DEVIATIONS FROM AVERAGE PRECIPITATION.

The following table shows, for certain stations, as reported by voluntary observers, the average precipitation for the month of June for a series of years; the precipitation for June, 1886; and the departures from the average:

Station.	County.	Average precipitation for June.	Number of years.	Precipitation for June, 1886.	Departure.
Arkansas.		*Inches.*		*Inches.*	*Inches.*
Lead Hill	Boone	5.16	4	5.42	+ 0.26
California.					
Sacramento	Sacramento	0.35	12	trace.	− 0.35
Connecticut.					
Canton *	Hartford	4.77	23	2.72	− 2.05
Hartford	Hartford	3.02	14	1.97	− 1.05
Middletown *	Middlesex	3.66	28	3.17	− 0.49
New Haven *	New Haven	3.19	14	2.84	− 0.35
Wallingford *	New Haven	3.72	29	3.78	+ 0.06
Dakota.					
Webster	Day	6.82	4	8.91	+ 2.09
Illinois.					
Anna	Union	6.24	11	3.84	− 2.40
Mattoon	Coles	5.32	6	3.67	− 1.65
Peoria	Peoria	4.03	30	3.67	− 0.36
Riley	McHenry	4.18	25	1.89	− 2.29
Sycamore	De Kalb	7.36	5	2.27	− 5.09
Indiana.					
Lafayette	Tippecanoe	5.66	7	2.60	− 3.06
Logansport	Cass	3.93	31	4.45	+ 0.52
Mauzy	Rush	5.42	6	8.34	+ 2.92
Spiceland	Henry	4.74	28	6.01	+ 1.27
Vevay	Switzerland	4.88	31	7.39	+ 2.51
Iowa.					
Monticello	Jones	4.43	33	1.41	− 3.02
Kansas.					
Independence	Montgomery	4.58	14	2.23	− 2.35
Lawrence	Douglas	4.89	18	3.71	− 1.18
Wellington	Sumner	4.71	8	7.71	+ 3.00
Yates Centre	Woodson	4.43	6	3.11	− 1.32
Maine.					
Cornish	York	3.29	29	2.19	− 1.10
Gardiner	Kennebec	3.26	45	1.84	− 1.42
Orono *	Penobscot	3.29	18	2.74	− 0.55
Maryland.					
Falleton	Harford	4.19	15	5.25	+ 1.06

Deviations from average precipitation—Continued.

Station.	County.	Average precipitation for June.	Number of years.	Precipitation for June, 1886.	Departure
Massachusetts.		*Inches.*		*Inches.*	*Inches*
Amherst *	Hampshire	3.68	51	1.80	— 1.88
Cambridge *	Middlesex	3.09	45	1.44	— 1.65
Chestnut Hill *	Middlesex	2.94	11	1.38	— 1.56
Framingham *	Middlesex	2.90	12	1.30	— 1.60
Lake Cochituate *	Middlesex	3.41	35	1.21	— 2.20
Lynn *	Essex	3.15	12	1.54	— 1.61
Mystic Lake *	Middlesex	2.90	11	1.52	— 1.38
New Bedford *	Bristol	3.17	73	1.99	— 1.18
Somerset	Bristol	3.31	16	1.29	— 2.02
Springfield *	Hampden	3.81	39	1.74	— 2.07
Taunton *	Bristol	2.59	11	1.29	— 1.30
Waltham *	Middlesex	3.17	62	1.29	— 1.88
Williamstown *	Berkshire	3.35	19	2.72	— 0.63
Worcester *	Worcester	3.15	46	2.15	— 1.00
Nevada.					
Carson City	Ormsby	0.48	7	0.05	— 0.43
New Brunswick.					
Saint John *	Saint John	3.32	26	1.39	— 1.93
New Hampshire.					
Concord *	Merrimac	3.26	31	2.48	— 0.78
Hanover *	Grafton	3.23	21	2.36	— 0.87
New Jersey.					
South Orange	Essex	3.17	16	2.50	— 0.67
New York.					
Factoryville	Tioga	3.71	5	1.87	— 1.84
Palermo	Oswego	3.29	33	3.44	+ 0.15
Plattsburg Barracks	Clinton	2.37	17	4.72	+ 2.35
Ohio.					
Wauseon	Fulton	4.45	14	2.01	— 2.44
Westerville	Franklin	3.73	12	2.11	— 1.62
Pennsylvania.					
Dyberry	Wayne	3.16	14	1.21	— 1.95
South Carolina.					
Kirkwood	Kershaw	3.69	20	7.07	+ 3.38
Stateburg	Sumter	3.62	6	5.35	+ 1.73
Texas.					
New Ulm	Austin	3.58	14	0.68	— 2.90
Vermont.					
Lunenburg *	Essex	3.54	38	1.70	— 1.84
Newport *	Orleans	4.02	12	4.55	+ 0.53
Strafford *	Orange	3.32	12	2.20	— 1.12
Virginia.					
Bird's Nest	Northampton	3.22	18	6.40	+ 3.18
Dale Enterprise	Rockingham	6.08	6	8.63	+ 2.55
Variety Mills	Nelson	3.34	8	6.21	+ 2.87
Wytheville	Wythe	3.97	23	4.59	+ 0.62
West Virginia.					
Helvetia	Randolph	5.76	10	5.46	— 0.30
Wisconsin.					
Madison	Dane	4.79	33	1.08	— 3.71

* From the "Bulletin of the New England Meteorological Society."

In connection with this subject, the following notes are furnished by voluntary observers:

Illinois.—Peoria, Peoria county: the greatest precipitation in any June during the preceding thirty years was 11.18, in 1882; least, 0.45, in 1863.

Indiana.—Vevay, Switzerland county: the greatest June precipitation during the past twenty-one years was 8.41, in 1875; the least, 1.36, in 1873.

Iowa.—Monticello, Jones county: during the past thirty-three years the greatest June rainfall occurred in 1865, 9.02; least, in 1857, 0.74.

Kansas.—Wellington, Sumner county: the rainfall of the present June, 7.71, is greater than that of any June during the past eight years; the least in that time was 3.20, in 1881.

Independence, Montgomery county: the total precipitation of the first six months of the present year, 13.06, is 7.20 below the average of the past fourteen years.

Lawrence, Douglas county: the total precipitation of the first six months of the present year, 19.54, is 2.45 below the average of the past eighteen years.

Maryland.—Fallston, Harford county: the largest June precipitation during the previous fifteen years was 10.21, in 1883; the smallest, 1.05, in 1873.

New York.—Palermo, Oswego county: the greatest June rainfall in the past thirty-three years was 8.80, in 1865; least, 0.70, in 1850 and 1864.

Ohio.—Westerville, Franklin county: the greatest June rainfall in the past twelve years was 7.53, in 1875; least, 2.11, during the present June.

Wauseon, Fulton county: the greatest June rainfall in the past sixteen years was 8.43, in 1881; least, 1.43, in 1872; the total rainfall of the first half of the present year, 13.07, is 6.13 below the average.

South Carolina.—Kirkwood, Kershaw county: with the exception of 7.43, in 1876, the rainfall of the present June, 7.07, is greater than that of any June during the past twenty years.

Texas.—New Ulm, Austin county: the greatest June rainfall in the past fourteen years was 11.33, in 1873; least, 0.51, in 1885; the greatest yearly rainfall (from June 30 to June 30) in that time, 81.79, occurred in 1881–'82; the least, 23.72, in 1885–'86.

Virginia.—Wytheville, Wythe county: the rainfall for the six months ending June 30th, 25.65, is 3.79 in excess of the average of twenty-three years.

Variety Mills, Nelson county: the rainfall of the present June, 6.21, is greater than that of any June during the past eight years; the least in that time was 1.46, in 1880.

Dale Enterprise, Rockingham county: the greatest June rainfall in the past six years was 11.00, in 1884; least, 1.13, in 1883.

Bruington, King and Queen county: the months of May and June have been unusually wet, the rainfall for the two months being 15.92.

SNOW.

The dates on which snow fell in the various states and territories are as follows:

California.—Fort Bidwell, 12th.

Colorado.—Pike's Peak, 2d, 4th, 5th, 6th, 10th, 20th, 23d, 26th, 27th.

New Hampshire.—Mount Washington, 13th.

Oregon.—Lakeview, 12th.

MONTHLY SNOWFALLS.

[*Expressed in inches and tenths.*]

Pike's Peak, Colorado, 16.4.

Mount Washington, New Hampshire, 0.6.

The only station reporting snow on the ground at the end of the month is Pike's Peak, Colorado—trace.

HAIL.

Gallinas Spring, San Miguel county, New Mexico: on the 1st, 2d, 4th, and 7th heavy hail fell in this and Lincoln county, doing great damage; numbers of horses, cattle, and sheep are reported to have been killed by hail-stones.

El Paso, Texas: on the afternoon of the 4th a destructive hail and thunder-storm passed over this place. The hail-stones were small, about the size of peas, but fell in large quantities and did considerable damage in the country about El Paso, injuring grape vines and beating down young plants.

Webster, Day county, Dakota: during the night of the 14–15th heavy hail fell and did considerable damage to windows and crops.

Fargo, Cass county, Dakota: during the afternoon of the 16th a heavy hail storm occurred in this county about twenty miles west of Fargo. Hail fell over an area seven miles long by two miles wide, cutting wheat badly and beating it to the ground.

Brainerd, Crow Wing county, Minnesota: a storm of hail and rain, which did considerable injury to growing crops, passed across the northern portion of the state on the 21st. Hail-stones of large size fell, damaging all kinds of vegetation, stripping corn of leaves and beating wheat to the ground.

Wausau, Marathon county, Wisconsin: a severe hail storm passed over a considerable portion of this county on the afternoon of the 21st. Great injury was done to the wheat and potato crops.

Eau Claire, Eau Claire county, Wisconsin: a severe hail storm passed over the southwestern portion of this county on the night of the 21st–22d. In the towns of Brunswick and Drammen the hail was destructive to wheat and other grain. The area covered by the storm was about four miles in width and eight in length.

Reading, Pennsylvania: a disastrous hail storm passed through the lower portion of Berks and the eastern end of Lancaster counties on the afternoon of the 25th. The storm continued about half an hour and was very destructive to tobacco and wheat.

Philadelphia, Pennsylvania: during the afternoon of the 25th a heavy thunder-storm, accompanied by hail, occurred. In the northern part of the city considerable hail fell and destroyed a number of windows. Some of the hail-stones were as large as hickory nuts. One person was killed and several injured by lightning.

Grafton, Walsh county, Dakota: a destructive hail and wind storm occurred in this vicinity on the 26th. Hail fell over an area twenty miles in length by two miles in width and extended into Grand Forks county. All crops in this area were reported to have been totally destroyed, and several buildings, including a church near Grafton, were demolished. In places, the hail had not melted thirty hours after the storm had passed. The total damage was estimated at $500,000.

Table of excessive and greatest monthly precipitation for June, 1886.

Station.	Specially heavy. Date.	Amt.	Largest monthly. Amount.
Alabama.			
Lineville	6, 7	2.38	12.41
Do	12	2.25	
Do	27	2.00	
Evergreen a	9	4.42	12.11
Union Springs	8, 9	2.13	11.80
Do	23, 24	4.18	
Do	27	2.27	
Gadsden	21	2.25	10.27
Opelika	8, 9	3.30	10.73
Newton	27, 28	2.50	10.70
Valley Head	22, 23	3.50	10.55
Greenville	24	2.10	10.08
Do	28, 29	2.26	
Tuscumbia c	21	2.02	9.16
Russellville	13, 14	2.20	9.05
Do	22, 23	2.20	
Florence	15	2.00	9.00
Tuscumbia b	15, 16	2.47	8.99
Montgomery	5, 6	2.81	8.61
Evergreen b	9, 10	2.27	8.41
Owiehee	23	2.00	8.36
Auburn			8.15
Eufaula	5, 6	2.80	8.13
Bermuda	25	2.00	7.43
Do	26	2.00	
Mt. Vernon B'ks			7.41
Calera	9, 10	2.01	7.32
Birmingham c			7.08
Greensborough			6.73
Pine Apple			6.62
Mount Willing			6.16
Livingston			6.14
Selma	5, 6	2.33	6.11
Birmingham b			6.02
Arkansas.			
Magnolia	8, 9	2.80	9.96
Do	15	2.50	
Little Rock	13, 14, 15	5.07	9.38
Malvern	14, 15	3.00	7.40
Russellville	12, 13	4.40	6.80
Brinkley	3	2.00	6.51
Forrest City	14	2.05	6.12
Fort Smith	12	2.11	6.09
Helena	14, 15	2.50	
Dist. of Columbia.			
Distrib'g Res'voir	22, 23	3.07	7.11
Do	25	2.05	
Washington City	22	4.16	6.75
Receiving Res'voir	23	2.86	6.07
Florida.			
Archer	8	2.18	13.55
Do	20 to 24	6.35	
Limona	18 to 23	6.25	11.68
Do	28	2.30	
Alva	20	4.50	11.46
Manatee	11, 13	2.10	11.14
Do	20, 21	5.00	
Sanford	19	2.48	11.08
Do	29, 30	2.83	
Waldo	21, 22	3.70	8.54
Cedar Keys	22, 23	3.70	7.81
Tallahassee			7.75
Pensacola	15	2.14	7.07
Do	20	2.30	
Live Oak	21, 22	2.38	7.09
Fort Meade	20	2.05	6.80
Merritts Island	22, 23	2.83	6.70
Jacksonville	21	2.26	
Georgia.			
Milton	6 to 9	6.04	11.69
Do	21	2.90	
Jesup	4	2.05	11.58
Do	13	2.77	
Do	21	2.37	
Forsyth	10	2.20	11.14
Do	21	2.25	
Do	29, 30	2.22	
Milledgeville	21	2.44	10.97
Do	29, 30	3.26	
Alapaha	8, 9	2.17	10.93
Do	28	2.12	
Do	30	2.16	
Bainbridge	24	2.05	10.68
Do	30	2.73	
Cartersville	21, 22	2.84	10.47
Waynesborough	6	3.05	10 07
Do	21	2.80	
Newnan			9.99
Augusta	21, 22	2.01	9.65
Smithville	5, 6	3.12	9.23
West Point			9.23
Athens a	5, 6, 7	2.67	9.08
Way Cross	4, 5	2.00	8.91
Do	21	2.22	
Atlanta	28, 29, 30	3.42	8.68
Columbus	4	2.96	8.48
Athens b	6, 7	2.53	8.48
Thomasville	30	2.50	7.76
Union Point	21	2.00	7.60
Eastman	21	2.04	7.34
Do	26	2.04	
Savannah			7.24
Griffin			7.06
Toccoa			6.56
Georgia—Con.			
Macon			6.51
Quitman			6.31
Fort Gaines			6.20
Camak			6.12
Illinois.			
Windsor	8, 9	2.53	6.39
Do	13	2.23	
Collinsville	20	2.25	6.55
Indiana.			
Blue Lick	27	2.97	10.06
Salem	13	2.21	8.92
Butlerville	15	2.28	8.51
Do	26, 27	3.26	
Mauzy			8.34
Vevay	27	2.25	7.39
Marengo	27	2.00	7.29
Huntingburg			7.04
Worthington			7.00
Seaman	15	3.12	6.68
Greenfield			6.63
Brookville			6.23
Richmond			6.09
Spiceland	9	2.02	6.01
Fort Wayne	23, 24	2.30	6.00
Iowa.			
Keokuk	28	2.48	
Kansas.			
Wellington	1, 2	2.98	7.71
Do	18, 19	3.23	
Ninnescah	1, 2	3.97	7.61
Do	19, 20	2.50	
Allison	15	2.19	6.39
Manhattan	26	2.50	
Topeka	25, 26	2.06	
Dodge City	18, 19	3.10	
Louisiana.			
Alexandria	15, 16	28.58	36.91
Cheneyville	6, 7	2.05	26.39
Do	15, 16	21.15	
Natchitoches	10	2.30	11.58
Do	15	2.21	
Do	27, 28	3.02	
Grand Coteau	4	3.06	11.31
Do	6, 7	2.56	
Do	12 to 17	4.31	
Opelousas	15, 16	3.66	10.10
New Orleans			9.30
Amité City			9.12
Monroe			8.25
Coushatta	28	2.60	6.58
Lafayette	6, 7	2.00	6.53
Minden			6.27
Liberty Hill	15, 16	2.13	6.26
Shreveport	28	2.02	
Maryland.			
Fort McHenry			6.08
Fallston	22, 23	2.20	
Woodstock	22, 23	2.21	
Baltimore	22, 23	3.19	
Mississippi.			
Aberdeen	21	5.40	13.50
Holly Springs	2, 3	3.09	11.65
Do	8, 9	2.07	
Do	17	2.00	
Okolona	9	2.00	11.71
Do	17	2.20	
Do	20, 21	3.00	
Do	28	2.25	
Hernando	14, 15	2.49	11.51
Do	19, 20	2.00	
Brookhaven	17	2. 6	11.34
Do	21, 22	2.73	
Columbus	17	2.00	10.50
Macon	9	2.00	9.07
Do	17	2.00	
Vicksburg	16, 17	2.64	9.03
Do	20, 21	2.31	
Port Gibson	17	3.53	9.36
Oxford	8, 9	2.00	9.41
Do	13, 14	2.95	
Waynesborough	20	2.00	8.76
Edwards	17	2.21	8.09
Natchez	16	2.90	8.19
Lake	7	2.50	7.53
Jackson			6.63
Batesville	14, 15	2.30	6.35
Grenada			6.24
Missouri.			
Chamois			7.66
Pierce City	13	2.00	7.40
Do	19	2.00	
Miami			7.39
Saint Louis	27	3.26	7.09
Laclin			6.75
Greenfield			6.30
Steelville			6.20
Lamar	12	2.23	
Central College	26	2.83	
Nebraska.			
Crete			6.10
New Hampshire.			
Mt. Washington			6.09
New Jersey.			
Upper Montclair	23	2.31	

Table of excessive and greatest monthly precipitation—Continued.

Station.	Specially heavy. Date.	Amt.	Largest monthly. Amount.
New Mexico.			
Gallinas Spring	1, 2	4.00	
North Carolina.			
Charlotte	6, 7	3.23	11.04
Do	28, 29	2.20	
Lumberton	6, 7	2.37	10.51
Cheraw	6	2.42	9.73
Kitty Hawk	3	2.30	8.95
Wash Woods			8.91
Reidsville	29, 30	2.05	8.84
Wilmington	28, 29	2.27	8.81
Lincolnton	21, 22	2.28	8.43
Wadesborough	29, 30	2.50	8.21
Lenoir			8.00
Weldon a			6.90
Weldon b			6.75
Salisbury			6.51
Statesville			6.26
Chapel Hill			6.22
Ohio.			
West Milton	23, 24	2.25	8.00
College Hill	9	2.10	7.75
Do	13	2.00	
Portsmouth			6.75
Jacksonborough			6.25
Pennsylvania.			
Grampian Hills	16, 17	2.50	
Philipsburg	18	2.40	
South Carolina.			
Yemassee	21	3.05	14.49
Do	26	5.00	
Do	28	2.06	
Chester	6 to 10	8.05	13.52
Do	29	2.10	
Spartanburg	6, 7	2.40	11.60
Do	21	2.20	
Do	29	2.30	
Greenville	7	2.41	10.99
Do	21, 22	2.75	
Branchville	8, 9, 10	3.74	10.90
Do	21, 22	3.75	
Charleston	21	2.39	10.78
Do	30	2.95	
Kingstree	21, 22	2.45	10.16
Do	28, 29	2.00	
Florence	22	2.21	9.82
Saint Matthew's	6	2.70	9.49
Do	9, 10	2.47	
Do	21, 22	2.28	
Blackville	9	2.15	9.36
Do	21	2.35	
Hardeeville	4	2.78	9.23
Do	28	2.00	
Pacolet	6, 7	2.35	9.20
Anderson	21, 22	2.08	8.63
Allendale	21	3.01	7.89
S. Carolina—Con.			
Greenwood	6, 7	2.55	7.32
Do	21, 22	2.10	
Saint Georges	21	3.08	7.19
Kirkwood	9, 10	3.09	7.07
Columbia			6.26
Batesburg			6.06
Tennessee.			
Greeneville	28, 29, 30	9.30	13.20
Waynesborough	17	2.10	11.53
Do	20	4.75	
Savannah	1, 2	2.99	11.14
Grand Junction	2, 3	2.39	10.48
Do	17	2.43	
Hohnwald	14, 15	3.36	10.34
Riddleton	27	2.51	9.52
Brownsville	14	2.15	9.35
Grief	6, 7	2.87	8.93
Bolivar a	13, 14	2.00	8.91
Do	16	3.72	
Parkeville			8.55
Bolivar b	14	2.05	8.45
Do	17	2.75	
Farmingdale	21, 22	2.10	8.41
Memphis	13 to 16	5.59	8.06
Andersonville			7.93
Cookville			7.85
Chattanooga	21, 22	2.13	7.84
Nashville	3	2 03	7.69
Covington	16	2.63	7.59
Austin	7, 8	2.31	7.37
Florence Station	16, 17	2.37	7.27
Paris	8, 9	2.12	7.08
Hurricane Swich	13, 14	2.45	7.03
Do	16, 17	2.80	
Sailor's Rest	7, 8	2.19	
Fostoria	21	2.00	
Texas.			
Brownsville	3	4.56	7.78
Galveston	6	3.52	6.19
Abilene	6	3.00	
Vermont.			
Charlotte	15	2.00	
Virginia.			
Dale Enterprise	13, 14	2.50	8.63
Do	24	2.37	
Lynchburg			8.48
Marion			7.80
University of Va.	22	2.10	7.33
Bruington			7.28
Fort Monroe			7.20
Bird's Nest			6.40
Variety Mills			6.31
Norfolk			6.06
Accotink	22, 23, 24	4.60	
Wisconsin.			
Manitowoc	15, 16	2.88	

Hail was also reported to have fallen in the various states and territories during the month, as follows:

Arkansas.—Little Rock and Lead Hill, 2d.

California.—Fort Bidwell, 5th; Susanville, 5th, 14th.

Colorado.—Pike's Peak, 1st, 27th, 30th; Denver, 14th; Colorado Springs, 23d.

Dakota.—Bismarck, 10th; Yankton, 14th; Webster, 14th, 16th, 18th; Fort Totten, 16th; Fort Yates, 17th; Deadwood, 24th, 30th; Fort Pembina, 27th.

Florida.—Archer, 6th; Limona, 28th.

Idaho.—Boisé City, 9th.

Illinois.—Chicago, 5th; Anna, 7th; Riley, 22d; Peoria, 22d, 23d; Rockford, 24th; Sycamore, 28th.

Indiana.—Vevay, 2d; Fort Wayne, 24th; Indianapolis, 25th.

Indian Territory.—Fort Supply, 15th, 16th.

Iowa.—West Union, 12th, 14th; Keokuk, 23d.

Kansas.—Wellington and Wyandotte, 1st; Ninnescah, 1st, 19th; Allison, 15th, 17th; Dodge City, 19th.

Michigan.—Thornville, 5th.

Minnesota.—Duluth, 4th; Saint Vincent, 8th, 26th; Moorhead, 11th; Saint Paul, 21st.

Nebraska.—Crete, 6th; Marquette, 14th; Valentine, 15th, 18th; Fort Robinson, 30th.

Nevada.—Fort Halleck, 1st, 12th, 13th, 15th.

New York.—Palermo, 7th; Mountainville, 9th; North Volney, 29th.

North Carolina.—Weldon, 27th.

Ohio.—Wauseon, 5th, 24th; Cincinnati, College Hill, Jacksonborough, Portsmouth, Garrettsville, and Hiram, 25th.

Oregon.—Lakeview, 3d.
Pennsylvania.—Pittsburg and Wilkesbarre, 25th.
Texas.—Abilene and Fort Davis, 6th; San Antonio, 27th; Midland, 29th.
Virginia.—Lynchburg, 22d.
Washington Territory.—Walla Walla, 9th, 29th.
Wisconsin.—Embarras, 21st.
Wyoming.—Fort Bridger, 2d; Fort Laramie, 21st.

SLEET.

Sleet occurred at Pike's Peak, Colorado, on the following dates: 3d, 4th, 6th, 7th, 8th, 11th, 15th, 16th, 17th, 19th, 21st to 24th.

TEMPERATURE OF WATER.

The following table shows the highest and lowest temperatures of water observed at the several stations; the monthly ranges of water temperature; the average depth at which the observations were made; and the mean temperature of the air:

Temperature of water for June, 1886.

Station.	Temperature at bottom.		Range.	Average depth, feet and tenths.	Mean temperature of the air at station.
	Max.	Min.			
	°	°	°		°
Atlantic City, New Jersey	72.0	55.3	16.7	11.0	65.7
Alpena, Michigan	68.3	58.5	9.8	12.7	58.5
Augusta, Georgia	83.0	71.8	11.2	12.3	75.4
Baltimore, Maryland	75.3	66.1	9.2	11.9	69.9
Block Island, Rhode Island	64.3	52.2	12.1	8.5	61.3
Boston, Massachusetts	62.1	55.4	6.7	19.6	63.1
Buffalo, New York	69.0	58.1	10.9	10.0	63.7
Cedar Keys, Florida	86.2	79.9	6.3	8.2	80.4
Charleston, South Carolina	81.8	74.9	6.9	38.2	77.3
Chicago, Illinois	69.2	57.1	12.1	9.1	66.0
Chincoteague, Virginia	79.5	68.3	11.2	2.9	68.9
Cleveland, Ohio	73.0	64.0	9.0	14.0	65.5
Detroit, Michigan	67.8	57.1	10.7	27.0	66.8
Duluth, Minnesota	63.1	38.7	24.4	10.2	57.6
Eastport, Maine	46.7	42.0	4.7	16.4	54.9
Escanaba, Michigan	63.9	49.4	14.5	18.7	60.0
Galveston, Texas	87.5	80.4	7.1	15.1	80.3
Grand Haven, Michigan	75.4	60.5	14.9	19.0	61.0
Indianola, Texas *					
Jacksonville, Florida	87.4	79.5	7.9	18.0	80.7
Key West, Florida	88.5	84.0	4.5	19.4	84.7
Mackinaw City, Michigan	63.1	48.9	14.2	10.0	58.2
Macon, Fort, North Carolina †	79.6	74.1	5.5	11.9	75.2
Marquette, Michigan	53.3	44.4	8.9	12.0	56.2
Milwaukee, Wisconsin *					
Mobile, Alabama	82.5	79.0	3.5	17.9	77.9
New Haven, Connecticut	69.6	61.5	8.1	16.6	63.1
New London, Connecticut	62.9	53.5	9.4	13.1	63.1
New York City	69.5	57.2	12.3	16.3	65.6
Norfolk, Virginia	76.4	69.3	7.1	16.2	71.3
Pensacola, Florida	84.0	74.5	9.5	17.7	80.4
Portland, Maine	60.6	48.7	11.9	16.7	60.8
Portland, Oregon	70.4	64.8	5.6	54.7	62.9
Sandusky, Ohio	77.8	67.0	10.8	11.0	66.3
Sandy Hook, New Jersey	67.3	59.2	8.1	13.1	64.9
San Francisco, California	64.3	55.7	8.6	36.8	57.9
Savannah, Georgia	78.7	73.0	5.7	10.3	79.8
Smithville, North Carolina	81.0	74.5	6.5	10.8	76.0
Toledo, Ohio	77.6	69.3	8.3	13.5	66.6
Wilmington, North Carolina	80.6	72.6	8.0	8.7	75.3

* Observations temporarily suspended. † Record for last 13 days of the month only.

COTTON REGION REPORTS.

In the following table are given the means of the maximum and minimum temperatures and the average rainfall for the cotton districts during the month of June. For the purpose of comparison the averages for these districts during the four preceding years are also given. More than twice the average amount of rain fell in the districts of New Orleans, Vicksburg, and Little Rock; in all the remaining districts a large excess also occurred, except in Galveston district, which shows a small deficiency. The mean of the maximum temperatures was below the average in all districts except Savannah. The mean of the minimum temperatures was above the average in all districts except New Orleans, Memphis, Montgomery, and Mobile. It will be seen from these comparisons that the range of temperature in the cotton districts during June was decidedly smaller than in the same month of former years:

Temperature and rainfall data for the cotton districts, June.

Districts.	Rainfall.			Temperature.							
				Maximum.			Minimum.			Extremes for June, 1886.	
	Average for June of four preceding years.	Average for June, 1886.	Departures.	Mean for June of four preceding years.	Mean for June, 1886.	Departures.	Mean for June of four preceding years.	Mean for June, 1886.	Departures.	Max.	Min.
	Inch.	*Inch.*	*Inch.*	°	°	°	°	°	°	°	°
New Orleans	4.57	11.20	+ 6.63	90.8	89.3	— 1.5	70.5	70.3	— 0.2	103	59
Savannah	5.74	8.26	+ 2.48	89.5	90.4	+ 0.9	69.2	71.2	+ 2.0	104	62
Charleston	5.68	9.96	+ 4.28	88.5	87.3	— 1.2	67.1	68.5	+ 1.4	99	60
Atlanta	4.94	8.29	+ 3.35	87.3	85.6	— 1.7	65.7	67.2	+ 1.5	99	57
Wilmington	5.04	7.78	+ 2.74	87.7	85.2	— 2.5	64.9	66.4	+ 1.5	96	50
Memphis	4.36	7.05	+ 2.69	88.0	85.1	— 2.9	66.8	65.4	— 1.4	100	40
Galveston	*2.68	2.30	— 0.38	*92.2	91.8	— 0.4	*70.2	70.4	+ 0.2	105	51
Vicksburg	3.20	8.15	+ 4.95	90.5	87.6	— 2.9	68.7	71.0	+ 2.3	97	63
Montgomery	4.78	7.12	+ 2.34	89.4	88.2	— 1.2	68.0	65.7	— 2.3	103	45
Augusta	4.98	8.11	+ 3.13	89.1	86.4	— 2.7	66.8	67.5	+ 0.7	100	60
Little Rock	2.76	5.82	+ 3.06	89.7	86.7	— 3.0	65.8	66.3	+ 0.5	100	48
Mobile	4.03	7.79	+ 3.76	91.8	87.6	— 4.2	69.9	69.1	— 0.8	102	58

* Average for June of three preceding years.

WINDS.

The most frequent directions of the wind during June, 1886, are shown on chart ii by the arrows flying with the wind; they are also given in the table of miscellaneous meteorological data. The winds for the month were variable over nearly the entire country; the only districts in which they were of a uniform direction were: the west Gulf States, prevailing direction generally from the south; extreme northwest and Missouri Valley, from the north; Montana, from the west; southern California and western Arizona, from the southwest.

HIGH WINDS.

[*In miles per hour.*]

Wind-velocities of fifty or more miles per hour were reported during the month, as follows:

Mount Washington, New Hampshire, 75, w., 3d; 63, sw., 7th; 86, sw., 8th; 63, nw., 9th; 60, nw., 10th; 70, w., 17th; 94, nw., 18th; 60, nw., 19th; 63, w., 26th; 59, w., 27th; 80, w. 29th; 58, nw., 30th.

Pike's Peak, Colorado, 52, w., 11th; 64, sw., 12th; 59, sw., 13th; 56, sw., 14th.

Galveston, Texas, 50, ne., 14th.

Fort Davis, Texas, 56, ne., 23d.

Cedar Keys, Florida, 68, e., 20th.

Cape Mendocino, California, 52, n., 7th.

LOCAL STORMS AND TORNADOES.

Valley City, Barnes county, Dakota: a tornado passed through this town on the 11th; it was preceded by a brisk, cool wind which was followed by severe thunder and lightning. Considerable damage was done to houses, trees, and telegraph poles. No lives were lost, the inhabitants generally taking refuge in their cellars.

Sacramento, California: on the 12th high northwesterly winds prevailed, at times reaching a velocity of forty-two miles per hour. Considerable damage was done to grain and fruit.

Princeton, California: the high north wind of the 11th, 12th, and 13th did great damage by whipping out standing grain; it was estimated that twenty-five per cent. of the crop was lost.

Virden, Macoupin county, Illinois: a severe wind and rain storm visited this place on the 13th. The rainfall was very heavy and the wind blew a gale, continuing ten or fifteen minutes and doing much damage. Several buildings were injured, the tin roof of a large hall was torn off and thrown into the street, and trees were uprooted. The storm was quite disastrous to wheat and other growing crops.

East Tawas, Iosco county, Michigan: a heavy wind and thunder-storm occurred at this place on the afternoon of the 15th. A block of houses in course of erection was leveled to the ground, and a quantity of lumber was blown from the docks into the bay.

Fort Worth, Texas: on the 16th a tornado passed across Cook and Denton counties, fatally injuring several persons and doing great damage to crops and farm buildings; many school buildings, barns, sheds, and out-houses were blown down. At McKenny the bridge over Wilson Creek was completely wrecked; a grocery store was damaged, the roof being carried away and the front of the building blown in; corn and cotton crops were beaten to the ground by the rain and wind. At Pleasant Valley the wind was very destructive, two churches being wrecked and other structures destroyed. At Valley View, Cook county, a drug store was moved from its foundations and turned around; other buildings were damaged, while fences, orchards, grain-stacks, and heavy trees were carried away and scattered in every direction. Two churches and several farm-houses were destroyed and one person killed at Itaska.

Bushnell, McDonough county, Illinois: a heavy wind storm, accompanied by rain and hail, occurred at this place on the afternoon of the 16th, blowing down trees, fences, and small buildings, and doing considerable damage to growing crops.

Farmington, Fayette county, Pennsylvania: at 9 a. m. of the 17th, a dark funnel-shaped cloud was seen passing with great velocity down the valley in which this town is situated. The tornado continued for a few minutes only, but it destroyed everything in its path, which was from ten to fifty rods wide; buildings were demolished, bridges and fences carried away, and trees thrown down.

Galveston, Texas: reports from Elgin, Manor, Paige, and other places on the Austin branch of the Houston and Texas Central Railroad, state that those places were visited by a heavy hail and thunder-storm on the 20th. At Elgin hail fell to a depth of several inches and the stones were unusually large. Nearly every building in the place had windows broken and roofs perforated. A church was completely demolished by the high wind, and sign-boards and trees prostrated. At Manor the storm did great damage to crops, hail-stones falling as large as hens' eggs. Three churches and many other buildings were damaged. At Mexia one church was wrecked and several houses unroofed. The corn crop was badly injured by hail. No lives were lost, the people seeking shelter in storm houses upon the approach of the storm.

Saint Paul, Minnesota: very severe thunder-storms occurred in this state on the 20th. At Fergus Falls the rainfall was heavy and the lightning sharp and incessant. One dwelling was struck by lightning and several persons injured. At Barnesville a school-house was struck and one side was shattered from the cupola to the ground. At Deer Creek a store was struck, instantly killing one person and injuring another.

Hutchinson, McLeod county, Minnesota: a tornado occurred three-quarters of a mile west of this village on the 23d. Trees a foot in diameter were thrown down and fences were carried away.

Shakopee, Scott county, Minnesota: a heavy thunder-storm, accompanied by destructive hail, passed over the northeastern portion of Elm Prairie township on the 23d. The corn crop suffered the most, being broken and beaten down by the hail and wind.

Fort Davis, Texas: a tornado occurred at this place on the 23d. The storm moved across the town from the northeast toward the southwest, unroofing several houses and destroying light buildings.

Wauseon, Fulton county, Ohio: about 2.45 p. m. of the 24th a tornado occurred in the northern part of this county, seriously injuring several persons and destroying considerable property. The course of the storm was a little south of east, and its width ten rods. The tornado was accompanied by hail and a heavy thunder-storm.

The following description of this tornado is from the report of the "Ohio Meteorological Bureau" for June, 1886:

The barometer had been slowly falling for five days, and at 14.00, the 24th, it was 29.698. About the time the thunder-storm appeared in the ssw., 12.30, the temperature was 78°.7. At 14.00 it was 74°.8; humidity 63 per cent.; wind wsw., 5; sky 10, and light rain and heavy thunder-storm coming on. There had been only a light breeze during the forenoon, and that was from the ne. to se. About 13.30 the wind changed to wsw., and raised to about thirty miles per hour. This high wind lasted only about twenty minutes. This is the record of this station. The tornado was formed about twelve miles

Report of tornadoes for the month of June, 1886, by Lieut. J. P. Finley, Signal Corps, U. S. Army.

Place.	Date.	Time.	Direction.	Form of cloud.	Number of persons killed.	Number of persons wounded.	Width of path.	Number and kind of animals killed.	Number and kind of buildings destroyed.	Total valuation of property destroyed.	Authority.
La Moure and Hunter, Dakota.	11	7 p. m		Funnel	1	8			1 dwelling, 1 granary, 1 stable.	Considerable	"Chicago Daily News," "Castleton Reporter," and numerous clippings.
Gentelly, Minnesota*	11	8.30 p. m.	e. by n.	Funnel							Postmaster at Gentelly, Minnesota.
Mercerville, Ohio†	13	6 p. m	ne.	Funnel			10 feet to 30 yards.			Small	Ross Halley.
Cox's Landing, West Virginia‡	13	5 p. m	ne.	Funnel						Small	Mrs. Adela R. Cox.
Montevideo, Minnesota	14	2 p. m	se.	Funnel					Several	Great	"Daily Pioneer Press," Saint Paul, Minnesota.
Brownsville, Nebraska	16	5 p. m	e.	Funnel			10 rods		Corn crib	Small	George D. Carrington.
Salado, Valley View, Mountain Springs, Burns City, Boston, Era, Pilot Points, Bloomington, McKinney, Pleasant Valley, Waco, and Denton, Texas. §	16	4 30 p. m	se.		Several	Several		Several horses	Many dwellings, barns, and out-houses, and 2 churches.	Very great	D. G. Adams and G. L. Spurlock, "New York Herald," and "Wilmington Weekly Star," North Carolina, and clippings.
Russell, Ackley Station, and Farmington, Pennsylvania.	17	9 a. m	e.	Funnel			20 rods		Numerous	Great	A. Nichols, H. T. Russell, W. C. Hale, and T. J. Houghton; also "New York Times," and "Jamestown Evening Journal," New York.
Hardy, Alma, Holland, Garfield, Blanket, Duval, Mexia, Greenock, Bart, Kimball, Florence, Weatherford, Waco, Dallas, Manor, and Cornhill, Texas. ‖	19	3 to 7.30 p. m.	se., s., sw.		Several	Many	1⅛ to 5 miles.	1 horse, several hogs, some cattle, 100 sheep, and 50 turkeys and chickens.	Several school-houses, several churches, numerous dwellings and out-houses.	Very great	L. B. Robenson, D. J. Fowler, W. P. Powell, B. P. Templeton, Robert L. Russell, John Edgar, F. T. Woodward, and A. F. Koehler; postmasters of Bart, Kimball, and Florence; "Weatherford Times," of Texas; and "Atlanta Constitution," Georgia; and several clippings.
Near Hutchinson, Minnesota¶	21	2 to 3 p. m.	ne.	Funnel			5 to 10 rods		Few	Small	Isaac Berfield, "Evening Star," Washington, D. C., "Chicago Inter-Ocean," and clippings.

* Cloud looked like a large inverted funnel with thick, white, rolling edges, especially at east side. The centre looked dark, and at times illuminated by lightning.

† Funnel-shaped cloud; after moving over one-third the arc of the horizon seemed to lengthen, so as its length became five times its width.

‡ One dense mass of clouds when first observed in sw. In a few minutes it seemed to come toward the earth, then rose, and then came down again.

§ Cloud from e. met that from n., forming a heavy, dark, low-hanging mass.

‖ Dark and heavy wall of clouds lining the northern horizon. At 3 p. m. a cloud seemed to separate from back-ground, growing darker as it approached. At 3.30 p. m. the heavens presented a fearful appearance in the n. The isolated cloud, now black as ink, was moving toward Greenock with great rapidity; it appeared, in shape and size, like a one acre plot of ground, with regular outlines.

¶ One observer remarks: "Funnel cloud, spreading like hour-glass." Another observer says: "In form of double funnel, lower one inverted." And still another observer says: "Long, narrow tail to upper cloud was an exact representation of coal smoke from standing locomotive on a calm day."

n. of here, near Lyons, and about 2.45 p. m., when about two miles s. of Philips' Corners, it came to the ground. Its course was a little s. of e. As it descended it unroofed the house of J. Stahl, on the west side of the road. A large piece of the roof was thrown about ten rods to the southeast, and other parts to the northeast. It next struck the barn of O. P. Barnes, which stood just at the south edge of the storm-track, and took the roof from one side. The house (made of plank) stood a little north of the centre of the track, and the whole upper part was taken up and ground to pieces. The north wall was left and the south wall taken to the floor. Mr. Barnes was jerked up by the wind and carried about five rods, passing over an apple tree, and, when he dropped, an apple tree fell on him. He was not seriously injured. A boy who was in the yard was thrown under a sled on which, almost instantly afterward, the corn-crib was dashed. The boy was but little hurt. A straw-covered shed was not touched, while a chicken house near by was totally destroyed, many of the chickens being killed. Mrs. Barnes, who was in the house, was struck on the head and breast, and is badly injured. When the storm had passed, she was found in the yard unconscious. A boy who was lying on a lounge in the house, was rolled off on the floor, and the quilt taken, which was found over half a mile to the east. Some of the goods were carried nearly three miles away. After passing the house it struck the orchard, which it nearly destroyed, the trees being broken off, or taken out by the roots. The track of the storm is only about twenty rods long by ten rods wide. It was not over half a minute from the time it first appeared till it was gone. It is described as a big blue ball, and roared louder than a train of cars.

Just after the tornado passed it rained very heavy, with a little hail. It hailed very heavy in all directions around. Some places the hail was three inches deep, and on the west side of the buildings there were chunks of ice weighing ten pounds forty-eight hours after the storm. The hail extended over a tract eight to ten miles wide by fifteen to twenty long. Some places crops were nearly ruined.

Washington, Washington county, Pennsylvania: this county was visited on the morning of the 25th by an unusually heavy thunder-storm and destructive rain. Hail fell in various parts of the county at different times during the day. A large number of telegraph poles were struck by lightning, interrupting communication with Wheeling, West Virginia. A tank-house of the Union Oil Company was struck and burned, together with five hundred barrels of oil. Reports from the surrounding country state that considerable damage was done by the heavy rain; meadows were flooded and bridges carried away by the high waters. All trains were delayed by land slides.

Newark, Licking county, Ohio: a destructive storm, accompanied by hail, visited this place on the 25th. Trees, fences, and out-buildings were blown down. During the storm the store-houses of the glass works were struck by lightning, and the buildings, together with their contents, consisting of a large amount of glassware, were burned.

Lancaster, Fairfield county, Ohio: a severe thunder-storm visited this place on the 25th, unroofing buildings, destroying trees, and doing much damage to the fruit, tobacco, and wheat crops.

NAVIGATION.

FLOODS.

Albuquerque, New Mexico: owing to heavy rains and melting snow in the mountains, the Rio Grande River was higher on the 2d than it has been since 1883. The towns of Chamberino, Launcen, and Nobre de Dios were completely overflowed and the inhabitants compelled to seek the hills for safety. At the Mexican town of Paso del Norte a very substantial bridge across the Rio Grande was considerably weakened, the embankments on both sides being washed away.

El Paso, Texas: on the 7th the Rio Grande River was ten feet above the low-water mark and remained stationary until the 10th, when it commenced falling slowly and at the end of the month was still four feet above the low-water mark at El Paso. Between the 7th and 10th railroad tracks were washed away in many places, several bridges destroyed, and three towns in the Mesilla Valley overflowed, the inhabitants being obliged to remove to the hills. Crops, stock, and a number of houses were washed away. Fort Hancock was submerged and abandoned by the garrison, the buildings having been undermined by the water.

Asheville, Buncombe county, North Carolina: on the night of the 8–9th a phenomenally heavy rain storm occurred in the vicinity of Marshall, in Madison county. A small mountain stream known as Rigsley's Run, which generally is only three or four feet wide, was suddenly converted into a destructive torrent. A railroad and turnpike on the margin of the stream were completely washed away in places, leaving gulleys where the road bed had formerly been; timber, houses, and large boulders were thrown upon the remainder of the track, delaying trains for several days. In the valley below considerable farm property was destroyed, crops being submerged, cattle drowned, and fences and small buildings carried away. This sudden rise of the stream is attributed by the inhabitants of this section to a waterspout which is reported to have formed a short distance north of Marshall.

Omaha, Nebraska: on the night of the 14–15th, about midnight, an exceedingly heavy fall of rain, which is described as a "cloud-burst," occurred at Osceola, Polk county. Nearly two miles of the Omaha and Republican Valley Railroad track were washed away, together with several buildings, horses, and wagons.

Cairo, Illinois: very heavy rain fell on the 16th, several washouts occurred on the Iron Mountain, and Texas and Saint Louis Railroads, delaying traffic for some time. Crops, also, were considerably damaged by the rain.

Alexandria, Rapides county, Louisiana: the rainfall of the twenty-four hours ending at 5 p. m. of the 16th was phenomenally large in this county, 21.40 inches falling at this place, and 13.20 inches at Cheneyville, a few miles southeast. Bad washouts occurred on the New Orleans division of the Texas Pacific Railroad, causing a suspension of traffic for several days. All that portion of the town extending from Third to Tenth streets, and from Madison street to the Morgan depot, was entirely submerged to the depth of three feet. Two men were drowned by the overflow.

Pittsburg, Pennsylvania: very heavy rain occurred during the night of the 16–17th, flooding several stores and dwellings in this city.

Nashville, Tennessee: reports from different sections of Tennessee indicate that great damage was done by heavy rains which fell from the 17th to 23d. Streams were overoverflowed and cut wheat carried away. Much wheat was also ruined by germinating in the shocks.

Lynchburg, Virginia, 23d: the crops in the surrounding country have been greatly injured by the heavy rains of the preceding week. The storm of the 21st did considerable damage; entire fields of grain were submerged with mud and water and rendered useless; gardens were also badly damaged. On the afternoon of the 23d a land slide occurred on the Virginia Midland Railroad track, covering it with a mass of earth, rocks, and trees.

Dale Enterprise, Rockingham county, Virginia: very heavy rain fell on the afternoon of the 24th, causing streams to rise rapidly. Cook's Creek was higher than has been known for many years, and all the lowlands suffered much from overflow.

Warrenton, Warren county, Missouri: on the 26th an unusually heavy rain fell, causing the creeks in the southern part of the county to rise higher than ever before known. Thousands of dollars worth of wheat and corn were carried away and destroyed.

The following is an extract from the Opelousas, Louisiana, "Courier," of June 26, 1886:

> The water in bayous Cocodrie, Bœuf, and Courtableau is higher than it has been for years, and at Washington on Wednesday last was only twenty-six inches below the high-water mark of 1882. Most of the farms on the west bank of the Bayou Bœuf are under water. This almost unprecedented overflow is caused by the heavy rains of the past two weeks, whereas the inundation of 1882 was from the breaking of levees on the Red and Mississippi rivers.

Milledgeville, Georgia: the heavy rain of the 28th, 29th, and 30th caused freshets in all rivers and creeks in this part of the state. Plantations on the river bottoms suffered heavily by the overflow, large areas of cotton and corn were submerged. The Chattahoochee branch of the Savannah, Florida, and Western Railroad sustained great damage, several bridges being destroyed and considerable track undermined.

Table of miscellaneous meteorological data for June, 1886—Signal Service observations.

Stations.	Elevation above sea-level.	Atmospheric pressure (in inches and hundredths).							Temperature of the air (in degrees Fahrenheit).														Mean rel. humidity.	Mean dew-point.	Precipitation.	Departure from normal.	Winds.					
		Mean actual barometer.	Departure from normal.	Mean reduced barometer.	Extremes.				Monthly mean.	Departure from normal.	Extremes.				Monthly range.	Daily ranges.										Total movement.	Prevailing direction.	Maximum velocity.		No. of rainy days.	No. of cloudy days.	No. of fair days.	No. of clear days.
					Highest barometer	Date.	Lowest barometer	Date.			Max.	Date.	Mean max	Min.	Date.	Mean min.		Greatest.	Date.	Least.	Date.						Miles p.h.	Direction.	Date.				
New England.																																
Eastport	61	29.86	+.02	29.93	30.24	21	29.38	18	0.86	54.9	— 0.4	75.9	18	64.8	41.3	7	47.0	34.6	28.8	22	9.4	13	78.6	47.5	0.66	— 3.48	3,874	s.	25	nw.	8	8	3	18	9
Portland	99	29.84	+.03	29.94	30.26	21	29.34	17	0.92	60.8	— 3.5	82.1	29	68.6	47.0	20	52.7	35.1	27.4	20	3.1	24	76.5	52.5	1.66	— 1.86	5,123	s.	22	s.	5	11	10	11	9
Mount Washington	6,279	23.81	.....	29.93	30.27	21	29.46	18	0.81	42.2	— 1.6	58.2	22	49.3	24.1	19	35.8	34.1	29.1	20	4.5	25	89.9	39.2	6.09	+ 3.48	19,895	nw.	94	nw.	18	17	3	20	7
Boston	125	29.83	+.01	29.90	30.27	21	29.44	17	0.83	63.1	— 3.1	81.7	29	70.8	50.1	6	55.7	31.6	25.4	29	2.3	24	70.6	52.1	1.34	— 2.31	7,206	w.	27	w.	26	12	9	12	9
Block Island	27	29.95	.....	29.97	30.30	21	29.48	17	0.82	61.3	— 1.2	74.1	27	67.2	47.6	6	56.3	36.5	19.3	11	3.2	14	88.8	57.8	2.15	— 2.21	6,925	sw.	31	sw.	3	9	6	16	8
Narragansett Pier									62.6	.....	80.0	26	71.3	43.0	6	54.0	37.0	.....	.....	.....	.....	.....	.....	.....	1.77	— 0.82	.....	.....	.....	12	.....	.....	.....
New Haven	107	29.87	.....	29.97	30.29	21	29.48	17	0.82	63.1	— 4.4	80.5	29	72.0	46.4	6	54.4	34.1	26.3	20	5.3	13	74.1	53.7	2.84	— 0.37	4,163	s.	18	nw.	18	10	6	15	9
New London	47	29.95	+.02	29.99	30.31	21	29.51	17	0.80	63.1	— 2.6	77.7	27	70.0	46.7	6	55.8	31.0	23.7	20	3.5	13	77.9	55.5	2.14	— 1.33	4,004	sw.	22	se.	23	10	10	16	4
Mid. Atlantic States.																																
Albany	83	29.90	+.03	29.98	30.29	21	29.46	17	0.83	65.8	— 2.7	83.0	29	75.3	49.3	9	56.5	33.7	30.0	20	5.0	14	65.0	52.4	3.19	— 0.71	4,426	s.	24	s.	2	9	10	12	8
New York City	168	29.82	+.01	29.98	30.30	21	29.50	17	0.80	65.6	— 3.0	83.0	11	73.8	53.0	4	58.7	30.0	21.7	29	4.4	23	77.7	57.7	3.01	— 0.27	5,219	s.	26	ne.	14	9	8	12	10
Philadelphia *	117	29.87	.00	29.98	30.30	21	29.52	17	0.77	68.6	— 2.7	86.0	13	78.5	53.6	4	60.5	32.4	25.2	13	8.4	22	73.1	52.6	2.86	— 0.52	5,924	s.	26	e.	26	8	9	17	9
Atlantic City	13	29.95	—.02	29.95	30.29	21	29.48	17	0.81	65.7	— 1.1	82.0	27	71.9	50.3	7	58.8	31.7	26.7	20	4.7	14	83.1	60.1	2.36	— 0.61	5,643	se.	35	se.	23	10	6	19	5
Sandy Hook	28	29.94	—.01	29.96	30.30	21	29.51	17	0.80	64.9	— 3.6	82.0	11	73.2	52.9	4	58.7	29.1	22.0	29	5.4	14	82.2	58.8	4.00	— 0.11	9,339	e.	40	e.	23	13	6	11	13
Cape Henlopen																																
Baltimore	45	29.94	—.02	29.96	30.27	21	29.56	17	0.71	69.9	— 4.0	89.0	17	78.1	51.8	5	62.6	37.2	23.1	13	8.1	23	71.1	59.1	5.64	+ 1.64	3,802	se.	18	nw.	26	13	7	16	7
Ocean City																																
Washington City	106	29.87	—.03	29.97	30.29	21	29.61	17	0.68	69.9	— 3.6	88.8	17	78.2	50.2	5	61.9	38.6	24.7	5	8.7	22	83.2	64.2	6.75	+ 2.40	3,701	s.	19	nw.	17	11	7	17	6
Cape Henry	16	29.97	—.02	29.97	30.29	21	29.62	17	0.64	70.1	— 3.2	93.8	17	75.4	57.8	1	64.7	36.0	22.3	17	4.6	19	81.7	63.9	4.23	+ 0.89	5,339	ne.	34	n.	1	17	11	11	8
Chincoteague	8	29.95	—.03	29.97	30.28	21	29.57	17	0.71	68.0	— 0.6	83.5	25	74.6	55.6	5	63.1	27.9	16.4	23	5.0	22	84.3	63.7	2.47	+ 0.11	6,542	se.	32	ne.	19	15	9	14	7
Lynchburg	652	29.30	—.02	29.96	30.22	20	29.64	17	0.58	70.5	— 3.9	88.3	13	79.6	52.4	5	62.7	35.9	24.7	1	8.1	22	84.2	65.0	8.48	+ 5.03	2,418	ne.	16	nw.	23	18	4	13	3
Norfolk	30	29.96	—.01	29.97	30.25	21	29.62	17	0.64	71.3	— 4.2	93.2	17	79.4	56.5	20	64.8	36.7	23.9	3	5.5	1	76.4	63.5	5.34	+ 1.09	3,634	e.	20	se.	22	17	11	13	6
South Atlantic States.																																
Charlotte	808	29.16	—.02	29.96	30.17	20	29.70	17	0.46	72.1	— 3.7	89.7	13	81.5	56.6	5	63.5	33.1	25.9	26	9.0	6	83.9	66.4	11.04	+ 6.93	3,272	sw.	24	e.	21	18	14	11	5
Fort Macon	11	29.98	—.07	29.96	30.17	21	29.73	17	0.45	73.2	+ 0.3	83.9	26	79.6	60.4	20	70.4	23.5	13.8	18	4.2	10	87.4	71.2	6.52	+ 1.01	11,401	sw.	47	ne.	30	12	10	13	7
Hatteras	12	29.98	—.02	29.98	30.23	21	29.73	18	0.50	73.5	— 0.5	84.0	26	78.8	60.0	4	68.0	24.0	17.0	18	7.0	5	82.2	67.6	5.51	+ 0.81	7,124	ne.	26	se.	22	16	10	11	9
Kitty Hawk	9	29.99	—.04	29.98	30.35	21	29.69	17	0.66	70.9	— 2.2	90.3	17	76.4	55.1	1	66.4	35.2	21.3	3	4.1	5	82.8	65.2	8.95	+ 4.30	10,179	ne.	40	ne.	19	13	9	14	7
New River Inlet																																
Smithville	34	29.95	—.05	29.96	30.16	20	29.72	18	0.44	76.0	— 0.8	86.6	17	81.4	59.0	20	69.2	27.6	17.8	18	6.9	21	84.2	70.7	3.68	+ 0.40	8,232	sw.	36	se.	22	15	7	16	7
Wash Woods									76.7	.....	91.0	17	84.1	64.0	1	69.3	27.0	.....	.....	.....	.....	.....	.....	.....	8.91	.....	.....	.....	.....	12	.....	.....	.....
Wilmington	52	29.94	—.03	29.97	30.19	20	29.73	18	0.46	73.3	— 1.3	92.2	11	83.6	56.3	20	67.8	35.9	25.9	11	6.6	9	80.4	68.2	8.81	+ 2.60	4,776	sw.	24	w.	30	16	12	13	5
Charleston	52	29.94	—.03	29.96	30.14	20	29.74	18	0.40	77.3	— 2.3	89.5	17	83.6	66.7	2	71.5	22.8	20.6	25	5.3	20	79.7	70.3	10.78	+ 5.45	5,869	e.	44	e.	21	15	15	12	3
Augusta	139	29.81	—.05	29.96	30.12	20	29.73	17	0.39	75.4	— 3.3	94.4	12	86.6	62.5	5	67.9	31.9	27.7	26	7.9	6	79.5	67.7	9.65	+ 5.59	2,502	ne.	24	ne.	21	17	14	11	5
Savannah	87	29.90	—.05	29.96	30.11	26	29.79	17	0.32	79.8	— 0.2	93.2	17	86.2	66.5	5	73.2	26.7	22.0	27	5.5	19	79.3	72.4	7.24	+ 0.24	5,071	s.	28	se.	21	17	9	17	4
Jacksonville	43	29.95	—.05	29.96	30.14	26	29.79	21	0.35	80.7	+ 0.2	94.3	28	88.6	66.9	2	73.9	27.4	21.0	3	7.8	23	77.1	72.5	4.78	— 0.97	4,675	se.	36	s.	29	16	5	22	3
Florida Peninsula.																																
Cedar Keys	22	29.97	—.05	29.95	30.15	26	29.70	21	0.45	80.4	— 0.4	90.1	13	86.2	66.4	21	74.4	23.7	17.4	21	6.1	24	80.7	73.6	7.81	+ 0.86	6,752	w.	68	e.	20	12	13	14	3
Key West	20	29.96	—.07	29.93	30.10	25	29.81	10	0.29	84.7	+ 1.5	99.8	25	92.5	73.6	12	78.3	26.2	24.3	12	5.0	1	74.9	75.5	2.51	— 1.55	7,433	se.	40	s.	20	16	11	13	6
Sanford	23	29.94	.....	29.93	30.11	26	29.80	10	0.30	79.3	+ 0.7	94.7	11	89.2	65.0	3	71.3	29.7	25.7	29	12.3	25	80.6	72.1	11.68	+ 3.07	3,894	e.	28	s.	29	18	3	18	9
Eastern Gulf States.																																
Atlanta	1,139	28.84	—.05	29.97	30.14	26	29.71	21	0.43	72.3	— 3.2	89.7	12	80.8	60.0	5	66.3	29.7	20.5	11	6.0	3	79.6	64.9	8.68	+ 4.35	5,884	e.	32	s.	23	21	12	12	6
Pensacola	30	29.92	—.08	29.91	30.13	26	29.76	21	0.37	80.4	+ 0.5	92.8	3	87.5	69.2	22	74.9	23.6	17.9	19	5.8	10	78.4	72.7	7.67	+ 2.32	5,274	s.	25	s.	29	14	5	17	8
Mobile	35	29.92	—.07	29.92	30.12	26	29.80	20	0 32	77.9	— 2.7	93.6	2	86.3	65.4	19	71.8	28.2	23.8	19	8.2	16	82.6	71.7	5.94	+ 0.42	4,896	se.	22	se.	16	20	5	18	7
Montgomery	219	29.73	—.06	29.92	30.11	26	29.74	21	0.37	77.5	— 1.0	95.0	12	87.8	63.9	22	70.5	31.1	23.0	3	6.8	20	79.4	69.8	8.61	+ 3.87	3,459	se.	32	w.	17	16	15	11	4
Vicksburg	222	29.71	—.08	29.91	30.08	26	29.62	16	0.46	76.4	— 3.6	93.1	26	85.9	65.8	20	69.8	27.3	25.1	2	6.8	15	81.0	69.5	9.63	+ 5.89	4,186	se.	24	se.	12	18	7	18	5
New Orleans	52	29.68	—.07	29.90	30.08	26	29.74	18	0.34	78.7	— 2.4	92.0	3	87.3	70.0	8	73.2	22.0	19.8	1	9.5	12	81.6	72.1	9.30	+ 3.27	3,839	se.	24	se.	13	21	7	16	7
Western Gulf States.																																
Shreveport	227	29.68	—.08	29.88	30.06	4	29.57	15	0.49	78.7	— 1.9	100.7	1	91.1	63.9	4	71.0	36.8	32.0	25	10.0	15	74.6	69.0	4.16	+ 0.76	4,281	se.	21	n.	15	13	8	16	6
Fort Smith	470	29.45	—.01	29.91	30.16	3	29.65	15	0.51	73.8	— 2.6	98.9	1	84.2	59.2	25	66.4	39.7	28.6	25	5.0	13	85.3	68.4	6.09	+ 2.71	2,649	o.	49	s.	19	13	10	14	6
Little Rock	299	29.61	—.05	29.88	30.10	3	29.64	16	0.46	74.5	— 3.5	95.2	1	83.5	60.2	5	67.6	35.0	26.2	25	6.9	15	86.6	69.8	9.28	+ 5.98	3,630	e.	24	nw.	2	10	12	12	6
Galveston	40	29.88	—.08	29.88	30.05	3	29.47	14	0.58	80.3	— 2.3	90.0	29	85.8	67.2	6	75.2	22.8	16.6	17	7.4	12	79.7	73.2	6.19	+ 2.00	6,822	s.	50	ne.	14	10	4	17	9
Indianola	26	29.87	—.08	29.86	30.03	4	29.63	14	0.40	80.8	— 1.2	93.6	16	89.0	67.1	7	75.7	26.5	18.7	23	5.6	13	79.7	73.4	2.97	+ 0.41	8,029	s.	49	ne.	29	10	2	20	8
Palestine	533	29.38	—.08	29.89	30.07	3	29.66	14	0.40	77.9	— 0.7	96.7	16	88.7	65.0	21	70.4	31.7	26.8	25	8.9	6	73.6	67.8	2.37	— 0.07	5,492	s.	48	nw.	16	9	5	15	10
San Antonio	781	29.10	—.05	29.85	30.02	4	29.65	15	0.37	78.8	— 3.1	100.6	19	91.2	62.7	24	69.2	37.9	29.6	24	11.1	3	72.8	68.0	3.52	+ 1.56	4,546	se.	34	ne.	27	9	9	12	9
Rio Grande Valley.																																
Brownsville	57	29.84	—.04	29.85	30.01	3	29.66	13	0.34	80.0	— 2.8	94.4	18	89.7	67.5	8	73.0	26.9	21.9	24	9.9	5	86.0	74.9	7.78	+ 6.06	4,102	s.	20	sw.	3	10	4	14	12
Rio Grande City	230	29.68	—.05	29.83	30.01	4	29.65	14	0.35	84.0	— 1.4	106.3	19	97.3	70.0	8	75.4	36.3	29.0	19	4.6	11	70.4	71.3	2.08	+ 0.88	3,853	se.	18	se.	29	9	5	17	8
Ohio Val. & Tenn.																																
Chattanooga	783	29.14	—.03	29.97	30.14	26	29.81	17	0.32	71.8	— 3.3	89.8	12	80.7	58.9	22	65.4	30.9	25.1	26	6.6	4	79.5	64.3	7.84	+ 3.29	3,428	sw.	22	n.	21	8	15	11	4
Knoxville	980	28.98	—.04	29.97	30.11	26	29.76	22	0.33	71.5	— 1.9	91.2	12	80.3	55.0	19	63.6	36.2	27.2	12	9.4	14	82.8	65.5	4.62	+ 0.25	3,195	sw.	24	ne.	22	17	14	12	4
Memphis	320	29.62	—.01	29.92	30.13	3	29.73	16	0.39	75.1	— 3.1	93.0	1	84.2	63.4	4	68.6	29.6	21.9	2	8.9	3	75.5	66.0	8.06	+ 2.99	3,866	nw.	26	sw.	2	15	11	14	5
Nashville	549	29.39	—.04	29.93	30.10	3	29.76	16	0.34	72.3	— 4.6	91.1	12	81.5	55.6	5	64.8	35.5	25.1	12	8.2	14	78.3	64.3	7.69	+ 3.52	3,327	nw.	29	nw.	1	16	11	14	5
Louisville	351	29.40	—.01	29.96	30.17	4	29.75	16	0.42	71.4	— 3.3	89.3	13	81.2	52.1	5	63.5	37.2	27.3	5	7.9	27	76.1	62.7	5.35	+ 0.95	4,169	n.	24	s.	13	15	13	11	6
Greencastle	897	29.04	.....	29.94	30.19	3	29.69	16	0.50	68.5	.....	84.5	16	76.9	48.1	4	61.1	36.4	23.7	7	6.7	27	73.6	59.0	3.59	.....	3,227	se.	15	n.	16	11	2	16	12
Indianapolis	766	29.17	—.05	29.93	30.20	3	29.68	16	0.52	69.2	— 3.2	89.0	16	78.8	46.9	4	59.6	42.1	27.4	5	8.9	13	69.4	57.5	4.92	— 0.55	3,151	s.	18	nw.	17	13	8	13	9
Cincinnati	628	29.32	—.01	29.96	30.18	4	29.70	17	0.48	69.7	— 4.2	85.5	12	78.5	50.7	4	62.3	34.8	26.3	6	4.6	27	73.1	59.8	5.26	+ 0.52	4,158	se.	28	n.	25	14	6	17	7
Columbus	805	29.12	—.02	29.95	30.16	4	29.67	17	0.49	67.6	— 3.1	87.1	16	77.4	44.3	4	57.2	42.8	29.0	1	8.5	27	78.3	60.2	2.69	— 1.30	3,682	se.	22	w.	17	14	7	12	11
Pittsburg	760	29.16	—.02	29.95	30.18	4	29.60	17	0.58	67.9	— 3.0	92.5	13	79.2	145.2	4	†58.2	47.†	33.1	13	17.8	22	75.1	59.0	5.17	+ 1.06	3,521	nw.	28	sw.	2	12	5	16	9
Lower lake region.																																
Buffalo	690	29.23	.00	29.95	30.20	19	29.52	17	0.67	63.7	— 0.8	84.6	15	70.8	46.2	19	55.8	38.4	28.8	1	5.6	26	74.6	54.8	3.39	+ 0.02	5,824	sw.	32	sw.	26	10	8	10	12
Oswego	335	29.59	—.01	29.94	30.22	20	29.46	17	0.76	61.3	— 2.9	80.9	15	69.6	43.1	4	52.8	37.8	27.3	7	7.9	23	70.5	51.0	1.03	— 2.35	6,251	w.	26	se.	23	10	8	11	11
Rochester	521	29.30	—.02	29.95	30.21	20	29.48	17	0.73	63.8	— 2.0	88.7	15	75.9	42.4	4	53.8	46.3	32.6	5	11.4	23	75.2	55.3	3.33	— 0.99	6,165	sw.	32	nw.	7	10	8	14	8
Erie	681	29.24	—.01	29.95	30.20	8	29.56	17	0.64	64.1	— 3.2	88.0	15	72.6	44.6	8	54.1	43.4	31.6	13	8.6	10	69.1	53.1	2.77	— 1.40	5,377	w.	24	w.	25	12	5	11	14
Cleveland	690	29.23	—.02	29.93	30.20	8	29.58	17	0.62	65.5	— 2.0	90.2	15	73.6	44.2	4	56.5	46.0	29.7	12	6.7	10	75.4	57.0	1.01	— 3.44	4,847	n.	22	nw.	17	8	6	11	13
Sandusky	639	29.31	.00	29.97	30.21	8	29.64	17	0.58	66.3	— 1.5	87.5	13	74.6	46.4	4	59.3	41.1	25.1	4	6.8	30	71.9	56.3	2.16	— 2.74	7,029	e.	35	n.	17	11	6	12	12
Toledo	651	29.29	+.02	29.96	30.20	8	29.63	17	0.58	66.0	.....	91.0	15	76.5	44.6	4	57.0	46.4	28.5	29	9.3	21	67.0	54.4	2.69	— 0.99	4,800	w.	26	nw.	17	7	4	17	9
Detroit	661	29.36	.00	29.95	30.22	8	29.60	17	0.62	66.8	— 0.5	89.2	15	75.9	49.0	8	58.6	40.2	24.8	26	6.0	21	76.4	58.8	2.07	— 1.70	5,603	n.	26	nw.	17	12	4	15	11
Upper lake region.																																
Alpena	609	29.29	.00	29.94	30.25	30	29.54	17	0.70	58.5	— 0.9	84.3	13	68.8	*41.1	18	*50.7	43.*	32.2	9	7.4	12	80.1	51.6	4.02	+ 0.16	5,713	se.	32	nw.	17	13	3	20	7
Escanaba	608	29.29	+.02	29.94	30.22	30	29.63	16	0.59	60.0	— 0.6	86.3	29	71.3	37.8	6	50.8	48.5	35.8	28	10.8	25	71.5	50.1	2.21	— 2.39	4,875	s.	24	n.	6	14	10	12	8
Grand Haven	620	29.30	.00	29.94	30.22	3	29.64	16	0.58	61.0	— 3.3	80.0	12	69.8	44.2	8	53.6	35.8	27.9	3	9.7	24	74.8	52.4	2.31	— 2.30	5,859	nw.	25	s.	2	5	1	13	16
Mackinaw City	605	29.28	—.05	29.93	30.23	30	29.56	17	0.67	58.2	— 0.6	81.6	13	67.7	39.3	8	49.2	42.3	34.5	4	5.0	23	74.8	49.6	2.12	— 0.46	5,062	w.	28	sw.	4	10	3	17	10
Marquette	672	29.23	+.01	29.95	30.22	30	29.68	16	0.54	56.2	— 2.6	87.2	13	67.2	39.0	7	47.1	48.2	36.5	8	10.1	10	73.1	46.8	3.79	— 0.29	5,131	nw.	26	nw.	2	14	6	17	7
Port Huron	633	29.29	+.01	29.96	30.22	8	29.57	17	0.66	61.7	— 1.2	86.2	15	70.5	42.2	8	53.0	44.0	31.5	2	6.8	30	70.1	53.6	1.02	— 2.99	5,325	ne.	26	n.	17	12	6	11	13
Chicago	661	29.27	+.02	29.96	30.24	3	29.70	17	0.54	66.0	+ 0.5	87.3	15	73.7	49.0	7	58.7	38.3	22.9	4	6.3	27	72.7	56.5	0.94	— 3.40	4,932	ne.	20	nw.	7	8	2	18	10
Milwaukee	697	29.23	+.02	29.95	30.22	3	29.67	16	0.55	61.5	— 1.4	86.0	9	71.6	42.4	8	53.4	43.6	33.8	9	11.2	23	74.8	52.9	2.54	— 1.69	5,645	e.	32	ne.	15	8	2	15	13
Duluth	672	29.23	+.01	29.95	30.23	28	29.70	13	0.53	57.6	— 0.7	87.5	29	69.0	38.9	8	49.0	48.6	40.4	13	4.8	11	72.6	47.3	5.35	+ 0.02	3,940	ne.	28	ne.	27	20	5	15	10
Extreme northwest.																																
Moorhead	923	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Saint Vincent	804	29.10	+.04	29.96	30.24	28	29.57	11	0.67	62.5	+ 1.0	87.2	30	76.0	30.0	5	47.3	57.2	44.5	5	11.6	1	82.1	56.8	2.15	— 0.53	5,169	n.	28	s.	30	9	8	12	10
Bismarck	1,694	28.17	+.03	29.93	30.25	2	29.53	11	0.72	65.3	+ 1.7	92.0	30	78.2	40.6	2	53.2	51.4	35.9	5	10.8	14	61.4	49.8	2.03	— 1.50	4,893	n.	28	ne.	14	11	3	20	7
Fort Buford	1,930	27.93	+.06	29.93	30.32	2	29.69	10	0.63	65.9	+ 2.2	93.7	30	79.5	36.2	2	52.9	57.5	37.8	3	10.8	13	53.2	45.2	0.93	— 2.23	5,836	se.	36	w.	9	7	9	17	4
Fort Totten	1,467	28.37	.....	29.93	30.19	2	29.61	11	0.58	61.7	.....	88.2	30	73.1	33.0	2	49.7	55.2	38.2	5	11.0	1	72.9	51.9	2.79	.....	7,461	n.	40	e.	14	15	5	15	10
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Table of miscellaneous meteorological data for June, 1886—Signal Service observations—Continued.

Stations.	Elevation above sea-level.	Atmospheric pressure (in inches and hundredths).								Temperature of the air (in degrees Fahrenheit).												Mean rel. humidity.	Mean dew-point.	Precipitation.		Winds.					No. of rainy days.	No. of cloudy days.	No. of fair days.	No. of clear days.
		Mean actual barometer.	Departure from normal.	Mean reduced barometer.	Extremes.				Monthly range of barometer.	Monthly mean.	Departure from normal.	Extremes.					Monthly range.	Daily ranges.						Total movement.	Prevailing direction.	Maximum velocity.							
					Highest barometer	Date.	Lowest barometer	Date.				Max.	Date.	Mean max	Min.	Date.	Mean min.		Greatest.	Date.	Least.	Date.			Miles p. h.	Direction.	Date.						
Upper Miss. Valley.																																
Saint Paul	831	29.06	+.03	29.93	30.21	29	29.64	12	0.57	65.9	— 1.3	90.6	11	76.9	42.8	3	56.3	47.8	29.0	30	9.3	27	73.1	56.1	3.63	— 1.30	4,261	nw.	37	nw.	21	12	3	16	11
La Crosse	725	29.18	+.02	29.92	30.21	3	29.65	14	0.56	69.1	+ 0.4	94.0	14	78.4	47.3	3	60.1	46.7	24.5	21	11.0	2	74.1	60.1	1.89	— 2.85	5,201	s.	28	nw.	15	10	4	16	10
Davenport	615	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	...	...	...	...	...	...	...	...
Des Moines	849	29.08	+.04	29.96	30.32	3	29.67	14	0.65	71.3	+ 1.8	101.4	14	85.2	44.3	3	60.6	56.8	34.1	30	14.6	2	68.7	59.5	1.21	— 6.70	3,273	n.	24	sw.	14	5	7	17	6
Dubuque	665	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	...	...	...	...	...	...	...	...
Keokuk	618	29.30	+.02	29.93	30.28	3	29.68	15	0.60	70.6	— 1.6	88.8	12	81.9	46.1	3	60.5	42.7	28.8	11	12.4	26	70.5	59.7	2.86	— 2.75	4,540	n.	27	s.	12	5	3	11	16
Cairo	359	29.59	—.03	29.94	30.18	3	29.75	16	0.44	71.9	— 3.5	88.4	12	79.4	55.5	4	65.9	32.9	20.0	12	7.1	16	76.5	63.2	4.87	+ 0.34	4,313	n.	28	s.	1	17	15	9	6
Springfield	644	29.28	—.01	29.92	30.25	3	29.67	16	0.57	71.4	0.0	88.1	12	81.0	49.5	3	61.6	38.6	27.1	12	11.0	26	67.7	59.6	3.83	— 2.66	4,165	s.	24	nw.	17	11	5	12	13
Saint Louis	571	29.36	—.01	29.94	30.25	3	29.69	16	0.56	74.2	— 0.3	90.8	16	82.3	57.0	3	67.1	33.8	24.9	18	6.6	26	71.1	63.4	7.09	+ 2.10	6,648	se.	38	se.	16	14	4	15	11
Missouri Valley.																																
Lamar	1,028	28.92	.....	29.96	30.26	3	29.72	15	0.54	70.7	.....	89.4	15	81.2	49.7	4	62.0	39.7	30.1	4	7.4	19	70.1	59.3	4.73	.....	5,468	ne.	28	ne.	15	8	7	13	10
Leavenworth	842	29.08	+.02	29.93	30.30	3	29.66	14	0.65	71.2	— 2.6	92.0	1	83.1	54.2	4	61.9	37.8	26.6	21	10.6	25	74.7	62.0	4.93	— 0.66	3,509	n.	28	s.	12	13	4	16	10
Omaha	1,113	28.84	+.06	29.97	30.34	3	29.64	14	0.70	70.2	— 1.4	92.4	14	82.1	47.1	3	60.5	45.3	29.6	10	10.0	15	69.1	58.6	1.50	+ 4.96	3,964	s.	32	se.	14	9	2	16	12
Valentine	2,603	27.32	.....	29.89	30.23	3	29.32	11	0.70	65.1	.....	93.1	11	76.7	43.3	3	54.9	48.0	31.2	17	7.6	1	61.7	49.8	2.25	.....	7,211	nw.	38	s.	30	13	8	14	8
Huron	1,307	28.58	+.03	29.92	30.26	3	29.50	12	0.77	65.3	— 0.8	90.4	11	78.9	39.1	3	52.1	51.3	37.3	4	16.7	14	77.6	57.1	1.90	— 2.80	5,074	nw.	30	sw.	11	11	5	10	15
Yankton	1,234	28.66	+.05	29.94	30.31	3	29.51	12	0.80	67.8	— 0.7	90.5	14	80.2	44.2	3	57.2	46.3	32.5	9	12.5	1	73.7	58.0	3.07	— 1.87	4,799	n.	30	s.	19	7	3	15	12
Northern slope.																																
Fort Assinaboine	2,720	27.14	+.05	29.95	30.36	2	29.70	30	0.66	65.4	+ 1.9	94.9	27	80.7	38.7	2	52.4	56.2	41.2	3	14.0	1	51.1	45.2	1.38	— 0.80	7,184	w.	45	s.	30	8	5	19	6
Fort Benton	2,681	27.19	.....	29.90	30.33	1	29.75	30	0.58	65.8	+ 3.6	95.7	22	82.3	38.6	3	52.1	57.1	47.1	3	9.8	13	47.6	42.8	1.53	— 0.70	2,772	w.	28	w.	29	14	9	13	8
Fort Custer	3,040	26.83	+.07	29.89	30.22	2	29.61	30	0.58	65.3	+ 1.3	95.0	30	82.1	41.8	2	51.5	53.2	43.6	29	12.9	13	56.5	46.6	2.90	+ 0.11	4,413	se.	44	n.	6	9	5	20	5
Fort Maginnis	4,340	25 58	.....	29.91	30.22	2	29.69	30	0.54	59.8	+ 1.5	89.2	29	74.1	35.7	2	49.3	53.5	30.5	3	7.7	13	60.2	44.9	2.55	+ 0.36	5,799	n.	28	w.	19	15	9	18	3
Fort Shaw	3,550	26.36	.....	29.94	30.29	2	29.77	30	0.52	61.2	+ 1.8	89.9	23	79.3	35 4	2	47.7	54.5	48.5	4	14.0	13	66.4	48.7	1.64	— 0.69	3,151	w.	36	w.	17	16	5	17	8
Helena	4,069	25.85	+.05	29.92	30.21	2	29.75	30	0.46	61.1	+ 0.7	88.3	27	74.4	40.0	14	49.2	48.3	39.1	3	13.5	13	52.3	41.6	1.14	— 1.47	5,825	sw.	40	sw.	27	12	5	16	9
Poplar River	2,030	27 82	.....	29.93	30.34	2	29.71	10	0.67	67.1	.....	97.5	30	82.3	32.8	2	51.5	64.7	43.3	3	15.5	13	61.0	51.0	0.80	— 1.04	5,665	w.	29	nw.	10	5	4	19	7
Deadwood	4,600	25.43	+.06	29.87	30.15	2	29.61	11	0.54	59.6	— 0.5	82.6	29	69.7	39.6	3	50.2	42.4	31.2	9	7.1	12	64.1	46.6	2.00	— 2.20	1,839	sw.	17	ne.	11	13	2	10	18
Cheyenne	6, 105	24.06	.00	29.80	30.03	2	29.50	12	0.53	59.3	— 1.9	88.5	10	75.3	39.9	3	46.2	48.9	38.9	17	14.0	2	62.3	45.2	1.52	+ 0.01	5,780	s.	29	nw.	18	10	5	15	10
North Platte	2,841	27.08	+.05	29.86	30.22	3	29.50	12	0.72	67.6	— 0.5	90.0	11	79.0	50.3	17	57.7	39.7	30.7	5	6.4	3	68.7	55.7	1.14	— 2.59	6,360	s.	36	se.	12	8	2	17	11
Middle slope.																																
Denver	5, 294	24.79	+.06	29.82	30.08	2	29.45	12	0.64	65.3	— 1.3	92.7	30	78.8	46.8	3	52.7	45.9	35.1	30	8.6	2	54.9	45.9	2.26	+ 0.40	4,990	n.	40	nw.	18	11	3	19	8
Pike's Peak	14, 134	18.02	.....	29.83	29.98	29	29.57	12	0.41	33.0	+ 0.6	52.1	28	39.7	24.0	2	28.4	28.1	20.1	28	4.7	2	82.6	28.2	2.44	+ 0.65	10,062	sw.	64	sw.	12	19	0	19	11
West Las Animas	3, 899	26.08	+.06	29.83	30.10	3	29.44	12	0.56	69.6	+ 0.4	98.0	13	85.9	48.3	6	56.2	49.7	40.5	10	8.2	2	64.1	54.8	1.19	— 1.33	5,821	e.	40	nw.	25	4	2	17	11
Concordia	1, 384	28.51	.....	29.91	30.30	3	29.58	14	0.73	69.9	.....	96.0	14	82.6	46.2	3	60.2	49.8	34.4	10	10.5	26	73.3	59.8	3.20	.....	5,388	e.	30	sw.	14	10	0	19	11
Dodge City	2, 517	27.41	+.07	29.88	30.24	3	29.55	14	0.69	71.2	— 1.6	95.2	14	83.6	47.2	3	60.4	48.0	34.3	4	10.2	15	74.9	62.0	5.47	+ 2.50	7,740	s.	44	e.	19	10	4	14	12
Fort Reno	.....	.....	.....	.....	.....	...	.....	...	.....	74.4	.....	101.1	1	86.2	49.0	4	62.5	52.1	.....	...	.....	...	.....	.....	3.13	— 4.33	.....	.....	.....	.....	...	6	...	...	...
Fort Supply	.....	.....	.....	.....	.....	...	.....	...	.....	76.0	.....	96.4	14	86.1	51.4	3	65.8	45.0	.....	...	.....	...	.....	.....	4.50	+ 0.23	.....	.....	.....	.....	...	12	...	...	...
Fort Elliott	2, 650	27.23	+ .09	29.88	30.18	3	29.65	14	0.53	72.2	— 0.8	95.5	1	84.0	48.7	4	61.9	46.8	30.2	4	14.6	2	65.3	58.4	3.45	— 0.63	7,784	se.	46	ne.	21	9	4	13	13
Southern slope.																																
Fort Sill	1, 200	28.71	+.01	29.88	30.13	3	29.67	16	0.46	76.8	— 0.6	103.0	1	88.5	51.7	4	66.5	51.3	33.8	25	7.0	12	62.9	61.4	1.08	— 4.33	8,479	n.	37	se.	19	6	2	11	17
Abilene	1,745	28.15	.....	29.90	30.15	...	29.64	15	0.52	78.9	.....	108.7	16	91.3	56.5	4	68.4	52.2	34.5	18	14.5	3	57.6	60.3	3.38	.....	5,676	n.	36	sw.	18	5	2	13	15
Fort Davis	4,928	25.19	—.01	29.76	29.92	3	29.60	12	0.32	73.6	— 1.3	99.5	19	88.9	49.5	8	60.6	50.0	33.6	30	18.5	7	45.7	47.4	2.18	— 0.07	4,828	ne.	56	ne.	23	9	3	12	15
Fort Stockton‡	3,004	26.92	—.01	29.80	30.05	3	29.63	12	0.42	77.4	.....	107.5	18	93.2	54.7	4	64.5	52.8	38.0	16	10.2	3	56.0	56.8	1.47	.....	4,125	se.	32	nw.	2	5	2	8	10
Fort Stanton	.....	24.01	.....	.....	.....	...	.....	...	0.38	63.4	.....	90.9	18	80.3	42.1	8	50.2	48.8	43.7	18	9.8	3	53.0	43.5	1.61	.....	4,074	w.	27	se.	23	11	2	9	19
Southern plateau.																																
El Paso	3,764	26 21	+.01	29.77	30.00	3	29.54	12	0.47	78.9	— 1.7	108.3	18	99.3	54.9	4	65.9	54.9	49.6	18	21.0	7	41.6	50.0	1.03	+ 0.56	2,492	e.	29	e.	23	6	1	9	20
Lava	.....	.....	.....	.....	.....	...	.....	...	.....	77.4	.....	105.0	18	95.9	48.9	5	58.8	56.0	.....	...	.....	...	.....	.....	0.29	.....	.....	.....	.....	.....	...	3	...	...	...
Santa Fé	7, 026	23.34	+.05	29.84	30.01	3	29.60	12	0.41	63.0	— 1.5	85.9	18	77.0	43.6	6	52.5	42.1	31.5	18	16.6	5	43.4	38.1	0.95	— 0.23	4,589	sw.	31	n.	23	5	0	10	20
Fort Apache	5, 050	25.04	+.03	29.77	29.94	30	29.56	11	0.34	69.1	+ 2.5	100.6	30	92.9	40.0	3	47.1	60.6	55.9	17	34.2	13	32.3	36.0	0.19	— 0.80	5,548	ne.	29	se.	4	3	1	5	24
Fort Bowie	.....	.....	.....	.....	.....	...	.....	...	.....	78.6	.....	104.0	20	92.6	55.0	4	64.7	49.0	.....	...	.....	...	.....	.....	0.21	.....	.....	.....	.....	.....	...	2	...	...	...
Fort Grant	.....	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	...	...	...	...	...	...	...	...
Fort McDowell	.....	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	...	...	...	...	...	...	...	...
Fort Thomas	.....	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	...	...	...	...	...	...	...	...
Fort Verde	.....	.....	.....	.....	.....	...	.....	...	.....	75.0	— 3.2	103.5	28	95.7	47.0	3	54.4	56.5	.....	...	.....	...	.....	.....	0.01	— 0.27	.....	.....	.....	.....	...	1	...	...	...
Maricopa	.....	.....	.....	.....	.....	...	.....	...	.....	87.2	.....	113.7	20	100.6	59.4	1	67.7	54.3	.....	...	.....	...	.....	.....	0.00	.....	.....	.....	.....	.....	...	0	...	...	...
Phœnix	.....	.....	.....	.....	.....	...	.....	...	.....	80.4	— 4.8	113.3	20	106.9	45.3	1	53.9	68.0	.....	...	.....	...	.....	.....	0.00	— 0.12	.....	.....	.....	.....	...	0	...	...	...
Prescott	5, 389	24 73	+.01	29.77	29.90	29	29.53	11	0.37	67.4	+ 1.1	93.1	20	85.9	42.0	1	49.6	51.1	44.9	19	23.8	13	37.7	37.9	0.00	— 0.16	4,971	sw.	29	sw.	12	0	0	4	26
San Carlos	.....	.....	.....	.....	.....	...	.....	...	.....	82.8	.....	109.0	21	103.0	53.4	19	62.5	55.6	.....	...	.....	...	.....	.....	0.00	.....	.....	.....	.....	.....	...	0	...	...	...
Willcox	.....	.....	.....	.....	.....	...	.....	...	.....	75.6	.....	105.5	20	99.7	48.0	4	51.6	57.5	.....	...	.....	...	.....	.....	trace	.....	.....	.....	.....	.....	...	1	...	...	...
Yuma	141	29.62	—.02	29.74	29.93	4	29.45	11	0.48	84.0	— 1.7	109.5	10	102.1	64.1	6	69.5	45.4	39.8	18	21.5	12	49.6	60.3	0.00	— 0.01	4,417	sw.	24	s.	12	0	0	0	30
Middle plateau.																																
Fort Bidwell	.....	25.38	.....	.....	.....	...	.....	...	0.39	61.9	.....	86.0	22	75.0	32.8	12	47.0	53.2	36.5	8	18.4	10	38.2	33.3	0.78	.....	3,962	w.	20	w.	5	6	4	7	19
Winnemucca	4,358	25.60	+.06	29.85	30.03	19	29.66	12	0.37	64.2	+ 0.8	94.0	22	80.7	35.3	13	47.9	59.6	42.7	29	15.8	12	32.6	30.1	0.76	— 0.24	5,761	sw.	31	e.	1	2	1	7	22
Salt Lake City	4,348	25.60	+.02	29.81	29.96	16	29.37	12	0.59	68.5	+ 1.1	95.2	23	81.3	42.2	13	56.4	53.0	34.2	9	13.9	2	81.7	62.5	1.02	+ 0.18	4,146	nw.	28	nw.	12	4	0	13	17
Montrose	5, 825	24.30	.....	29.80	29.94	4	29.51	11	0.43	66.8	.....	89.5	29	83.7	41.8	1	51.8	47.7	40.7	17	24.1	13	34.7	33.6	0.01	.....	5,981	se.	30	w.	2	1	0	11	19
Fort Bridger	.....	23.56	.....	.....	.....	...	.....	...	0.52	54.6	.....	80.4	29	70.9	29.2	14	39.9	51.2	38.8	17	21.2	11	62.0	40.3	1.16	.....	5,214	sw.	36	w.	13	10	3	15	12
Northern plateau.																																
Boisé City	2,750	27.12	.....	29.90	30.10	19	29.71	26	0.38	66.9	+ 0.9	95.8	22	81.7	39.5	14	51.6	56.3	41.1	21	12.4	13	47.9	43.5	0.44	— 0.52	3,302	nw.	21	nw.	5	4	1	9	20
Cœur d'Alene	.....	.....	.....	.....	.....	...	.....	...	.....	61.1	.....	88.0	3	75.6	39.0	12	46.6	49.0	.....	...	.....	...	.....	.....	0.98	— 0.07	.....	.....	.....	.....	...	4	...	...	...
Ashland	.....	.....	.....	.....	.....	...	.....	...	.....	64.8	.....	94.0	2	80.7	41.0	18	48.9	54.0	.....	...	.....	...	.....	.....	0.72	.....	.....	.....	.....	.....	...	3	...	...	...
Fort Klamath	.....	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	...	...	...	...	...	...	...	...
Lakeview	.....	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	...	...	...	...	...	...	...	...
Linkville	.....	.....	.....	.....	.....	...	.....	...	.....	60.8	.....	89.1	4	75.5	37.6	10	46.2	51.5	.....	...	.....	...	.....	.....	1.19	.....	.....	.....	.....	.....	...	6	...	...	...
Fort Spokane	.....	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	...	...	...	...	...	...	...	...
Spokane Falls	1, 909	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	...	...	...	...	...	...	...	...
Walla Walla	.....	28.90	.....	.....	.....	...	.....	...	0.41	68.0	.....	93.0	4	81.3	43.6	13	56.8	49.4	34.9	2	12.5	10	42.0	41.5	0.73	.....	4,853	sw.	24	sw.	10	10	9	11	10
N. Pac. coast region.																																
Fort Canby	179	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	...	...	...	...	...	...	...	...
Neah Bay	.....	.....	.....	.....	.....	...	.....	...	.....	56.4	.....	72.5	13	65.8	38.0	12	47.0	34.5	.....	...	.....	...	.....	.....	3.70	.....	.....	.....	.....	.....	...	11	...	...	...
Olympia	36	30.00	+.02	30.04	30.24	11	29.81	15	0.43	59.9	+ 1.1	91.9	2	72.6	36.2	12	47.7	55.7	43.6	2	12.1	6	73.2	50.2	1.26	+ 0.10	3,014	s.	16	ne.	11	10	10	10	10
Port Angeles	14	30.02	.....	30.04	30.21	11	29.83	15	0.38	53.8	.....	81.3	13	62.3	38.6	12	46.5	42.7	38.2	13	8.4	16	81.8	48.0	0.70	.....	3,957	w.	22	w.	5	8	9	14	7
Pysht	.....	.....	.....	.....	.....	...	.....	...	.....	56.7	.....	77.0	13	66.9	38.0	12	46.5	39.0	.....	...	.....	...	.....	.....	2.33	.....	.....	.....	.....	.....	...	9	...	...	...
Tatoosh Island	86	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	...	...	...	...	...	...	...	...
Astoria	.....	.....	.....	.....	.....	...	.....	...	.....	57.8	.....	69.0	20	63.7	47.0	28	51.9	22.0	.....	...	.....	...	.....	.....	2.05	.....	.....	.....	.....	.....	...	16	...	...	...
Portland	80	29.95	+.02	30.04	30.26	11	29.78	15	0.47	62.9	+ 1.1	95.0	2	75.5	46.5	12	53.5	48.5	35.3	2	9.8	9	67.4	50.7	0.67	— 1.12	3,548	nw.	22	s.	14	7	10	11	9
Roseburg	523	29.51	+.03	30.06	30.26	11	29.86	15	0.40	61.5	+ 0.3	86.8	2	75.9	44.3	13	48.3	42.5	38.6	1	14.9	30	62.5	47.1	0.13	— 0.95	1,699	nw.	13	nw.	11	2	4	12	14
Mid. Pac. coast reg.																																
Cape Mendocino	637	29.37	+.03	30.04	30.20	19	29.89	2	0.32	54.0	— 0.3	65.9	26	59.6	47.0	12	49.9	18.9	14.2	8	6.5	15	81.8	48.5	0.04	— 0.71	16,427	n.	52	n.	7	0	4	17	9
Red Bluff	342	29.53	—.02	29.87	30.08	19	29.72	24	0.36	79.1	+ 3.3	102.7	21	92.1	55.8	13	64.6	46.9	34.5	2	20.8	12	35.4	47.0	trace	— 0.42	5,671	n.	28	n.	12	0	0	4	26
Sacramento	64	29.82	—.03	29.87	30.06	19	29.66	11	0.41	69.0	+ 0.3	97.7	8	85.3	51.5	29	57.0	46.2	35.5	19	15.0	12	60.4	53.5	0.00	— 0.29	5,837	s.	42	nw.	12	0	0	0	30
San Francisco	60	29.90	—.02	29.95	30.14	30	29.74	11	0.40	57.9	— 0.5	82.8	8	67.8	48.3	6	51.1	34.5	27.6	8	8.4	4	72.4	48.9	0.01	— 0.31	9,366	w.	34	w.	18	0	2	10	18
S. Pac. coast region.																																
Los Angeles*	339	29.56	.00	29.91	30.04	4	29.72	11	0.32	66.1	+ 0.7	91.6	18	80.9	48.2	1	56.8	43.4	39.4	19	9.6	12	75.9	57.2	0.11	— 0.08	3,786	w.	17	w.	13	1	3	16	10
San Diego	67	29.85	—.02	29.89	30.01	4	29.74	41	0.27	63.1	— 1.3	74.8	19	69.5	54.3	18	58.6	20.5	20.2	19	6.2	6	80.6	56.8	0.06	— 0.01	4,534	sw.	24	sw.	11	1	12	15	3
San Luis Obispo	.....	.....	.....	.....	.....	...	.....	...	.....	.....	.....	.....	...	.....	.....	...	.....	.....	.....	...	.....	...	.....	.....	.....	.....	.....	...	...	...	...	...	...	...	...

* Record for 29 days. † Record for 28 days. ‡ Record for 20 days.

Americus, Sumter county, Georgia: on the night of the 29–30th a severe wind and rain storm passed over this place; trees and fences were blown down and corn broken off; much damage was done to mill property and county roads.

Savannah, Georgia, 30th: the continued heavy rains of the last days of the month have seriously injured the crops in Clarke county. The streams of Oglethorpe county were higher than has been known in years. In Sumter county the corn crop was much injured by wind, it being estimated that one-half was broken off. Bottom lands were overflowed, and crops completely destroyed.

Eastman, Dodge county, Georgia: the heavy rain of the 30th did much damage in this county. Bridges and grist mills on water courses were washed away, and crops greatly injured.

Sofkee, Decatur county Georgia: on the 30th this section was visited by a destructive rain and wind storm. Rain began falling early in the morning and continued during the day, it was especially heavy from 3 to 5 p. m., when it was accompanied by a severe northeast gale. All mills using water as a motor were partly destroyed, fences were blown down or crushed by falling timber, and bridges were carried away by the freshet. The roads were badly washed and blocked with trees and debris. The storm was especially severe on growing crops; cotton and corn were beaten to the ground and submerged in mud; peach and pear trees were blown down by thousands and much ripe fruit destroyed.

Grand Coteau, Saint Landry parish, Louisiana, 30th: during the month the amount of rainfall was about double the average for June, and considerable damage to crops was done by the overflow of streams.

Spartanburg, Spartanburg county, South Carolina, 30th: the month has been very rainy, causing floods in the lowlands and injury to crops.

STAGE OF WATER IN RIVERS.

In the following table are shown the danger-points at the various river stations; the highest and lowest depths for June, 1886, with the dates of occurrence, and the monthly ranges:

Heights of rivers above low-water mark, June, 1886.

[*Expressed in feet and tenths.*]

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
Red River:						
Shreveport, Louisiana	29.9	1	4.8	14	1.8	3.0
Arkansas River:						
Fort Smith, Arkansas	22.0	26	6.6	6	2.6	4.0
Little Rock, Arkansas	23.0	16	8.9	10, 11	2.8	6.1
Missouri River:						
Yankton, Dakota	24.0	21	22.9	1	16.6	6.3
Omaha, Nebraska	18.0	11, 12	12.9	30	10.1	2.8
Leavenworth, Kansas	20.0	21, 24	14.3	1	9.3	5.0
Mississippi River:						
Saint Paul, Minnesota	14.5	20	6.3	11, 12	3.3	3.0
La Crosse, Wisconsin	24.0	27, 28	6.5	15, 16	4.9	1.6
Dubuque, Iowa	16.0	.....	.....	.....	.....	.....
Davenport, Iowa	15.0	.....	.....	.....	.....	.....
Keokuk, Iowa	14.0	1	7.8	22 to 25	3.9	3.9
Saint Louis, Missouri	32.0	28	20.6	8, 9	15.0	5.6
Cairo, Illinois	40.0	30	39.6	10, 11	30.3	9.3
Memphis, Tennessee	34.0	1	24.2	12, 13	16.6	7.6
Vicksburg, Mississippi	41.0	1	41.9	19	25.4	16.5
New Orleans, Louisiana	13.0	2 to 8	14.4	19	11.8	2.6
Ohio River:						
Pittsburg, Pennsylvania	22.0	18	11.3	2, 3, 4	2.0	9.3
Cincinnati, Ohio	50.0	30	25.0	11	9.5	15.5
Louisville, Kentucky	25.0	30	10.3	14	5.7	4.6
Cumberland River:						
Nashville, Tennessee	40.0	27	23.0	1, 2	5.1	17.9
Tennessee River:						
Chattanooga, Tennessee	33.0	23	16.0	30	7.2	8.8
Monongahela River:						
Pittsburg, Pennsylvania	22.0	18	11.3	2, 3, 4	2.0	9.3
Savannah River:						
Augusta, Georgia	32.0	8, 9	19.4	4, 5	8.9	10.5
Mobile River:						
Mobile, Alabama	.....	15	8.8	2, 3	17.3	1.5
Sacramento River:						
Red Bluff, California	.....	1, 5	3.2	22 to 30	2.4	0.8
Sacramento, California	.....	1, 2	20.8	30	13.9	6.9
Willamette River:						
Portland, Oregon	.....	9, 10	20.0	30	14.0	6.0
Colorado River:						
Yuma, Arizona	.....	6, 7	26.7	30	20.0	6.7

HIGH TIDES.

Chincoteague, Virginia, 15th.
Cedar Keys, Florida, 21st.
Manatee, Florida, 29th.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Tatoosh Island, Washington Territory: an aurora was observed at 8.40 p. m. of the 1st, consisting of a pale straw-colored light, extending from 5° east to 26° west of the magnetic meridian.

Fort Buford, Dakota, 2d: an aurora began at 10.50 p. m., consisting of four streamers of a reddish hue, extending to about 50° altitude, and from 360° to 35° azimuth. The streamers appeared to be stationary, and were at their maximum intensity between 11 and 11.15 p. m., after which they gradually faded and disappeared at 11.35 p. m.

Saint Vincent, Minnesota: at 10 p. m. of the 4th an aurora was observed in the northern sky. It consisted of a horizontal band of straw-colored light extending from northwest to northeast and resting on a dark segment. The light was about 16° in altitude and presented an undulating appearance. The display was not active and remained as first observed until the early morning of the 5th, when it disappeared.

Harvard College, Cambridge, Massachusetts: on the 4th an auroral arch became visible as soon as the twilight had disappeared. The aurora became quite distinct at 9 p. m., streamers appearing at 9.15 p. m., some of which were very long and bright.

Duluth, Minnesota, 4th: a pale straw-colored auroral light was observed from 9.40 p. m. until about midnight. Average altitude of the aurora was 30°, azimuth, 150° to 250°.

Gardiner, Kennebec county, Maine: a faint aurora was seen at 9 p. m. of the 4th. It became brighter at 10 p. m., but was nearly obscured by clouds; at midnight a bright arch was seen with streamers nearly extending to the zenith.

Mount Washington, New Hampshire: at 9.20 p. m. of the 4th a faint auroral light was seen, extending from 50° west to 60° east of north. The aurora increased rapidly in brilliancy and extent; at 9.30 p. m. the arch extended from 70° west to 80° east of north, and to an altitude of 12°, at the same time brilliant white fleecy streamers rose rapidly from the arch. The maximum brilliancy occurred at 10.10 p. m., after which the light gradually faded and disappeared at 11.50 p. m.

Eastport, Maine: a brilliant auroral display was observed from 7.35 to 10.10 p. m. of the 4th. The arch was 45° in altitude and extended about 140° along the horizon; waves of white light shot up from the borders of the arch towards the zenith, making an illumination strong enough to cast a shadow. The aurora was at its maximum brilliancy at 9.30 p. m.

Washington City, District of Columbia: an aurora was seen at 9.53 p. m. of the 4th. It was first noticed as two bright areas of light in the north with a dark space between. The altitude was about 30° and the width 20° on either side of the north point of the horizon. The western portion had an appearance of streamers which gradually moved eastward across the dark space and finally coalesced with the eastern portion of the aurora. The display ceased at 9.59 p. m.

Boston, Massachusetts, 5th: An aurora was visible from 8.45 to 10.45 p. m. The beams were well-defined and were from one to two degrees in breadth; at times they became very bright, changing from a pale yellow to light red. Altitude of aurora, 25°; azimuth, 120° to 240°.

Fort Buford, Dakota: a white auroral light was observed from 12.58 until 2.10 a. m. of the 5th, extending to about 20° altitude and 45° azimuth. The light was irregular in form and at the period of maximum brilliancy a few streamers of reddish tinge were visible.

Marquette, Michigan: a pale auroral light was seen from 10.25 to 10.50 p. m. on the 5th. Streamers of various heights were observed, several extending to the zenith.

Duluth, Minnesota: a pale green auroral light was observed from 11 p. m. of the 6th until 1 a. m. of the 7th. No motion or beams were noted, but a steady light extending to an altitude of 20°.

Grand Haven, Michigan: at 10.58 p. m. of the 24th two broad, rose-colored streams of auroral light were observed in the northern sky, issuing from behind heavy cumulus stratus clouds. At 11.15 p. m. the sky had become entirely overcast and the aurora was hidden from view.

Grand Haven, Michigan: at 11.40 p. m. of the 25th an aurora was observed which continued until 11.35 p. m. It extended from azimuth 135° to 220°, and reached an altitude of 40°.

Port Huron, Michigan, 29th: a faint aurora, of 15° altitude and 60° azimuth, was observed from 9.55 to 11.30 p. m. It consisted of a dark base upon which rested a bright arch of diffused white light, resembling the morning twilight. The display was at its maximum brilliancy at 10.30 p. m., after which it gradually faded and entirely disappeared at 11.30 p. m.

Boston, Massachusetts: an auroral arch, of pale straw color, was observed from 8 p. m of the 29th until 3.30 a. m. of the 30th. Altitude, 20°; azimuth, 150° to 220°.

Oswego, New York: at 9.45 p. m. of the 29th an auroral arch, of seven degrees altitude and 90° azimuth, was observed. Beams of light extended upward to the height of 40°. The aurora continued until after midnight.

Portland, Maine: an aurora was observed from 9 p. m. until midnight of the 29th. It first appeared in the form of slender beams of light arising from an irregular arch. At 10 p. m. it was at its maximum brilliancy and had a motion from west to east. At 10.30 p. m. the aurora had faded away, but reappeared about 11 p. m. and continued until midnight.

Valentine, Nebraska: at 10.20 p. m. of the 29th an aurora was observed extending from about 15° west to 10° east of north. It consisted of a diffused straw-colored light, with indistinct streamers, extending to an altitude of 45°. The aurora increased in brilliancy and was at its maximum at 2 a. m. of the 30th, after which it gradually faded and disappeared in the early morning.

Alpena, Michigan: an aurora was seen at 9 p. m. of the 29th, consisting of a pale white light resting on a dark segment; the arch was about 90° azimuth and 30° altitude. Faint streamers shot up to an altitude of from 10° to 25°. The display continued until 3 a. m. of the 30th.

Saint Paul, Minnesota: a faint white auroral light was visible from 11 p. m. until midnight of the 29th. The illuminated space was a segment of the sky 10° in altitude at the centre and situated between 170° and 195° azimuth.

Bancroft, Kossuth county, Iowa: on the 29th a bright auroral arch was seen in the north, of 9° altitude, and extending from 135° to 225° azimuth.

Clayton, Gloucester county, New Jersey: on the 29th an aurora was observed, extending from northwest to northeast, with streamers shooting up to an altitude of 45°.

Burlington, Vermont: a brilliant aurora was observed from 8 to 10 p. m. of the 29th; the display consisted of waving beams of light which appeared between the northern horizon and the zenith.

New London, Connecticut: an auroral light was observed on the night of the 29–30th from 9 p. m. until daylight. The aurora presented a brilliant appearance at 2 p. m., when several streamers, varying in altitude and width, were seen to appear and disappear at short intervals. An aurora was also visible about 9 p. m. of the 30th.

Bismarck, Dakota: an auroral display was observed from 1 to 4.30 a. m. of the 30th. Streamers of bright yellow light ascended to an altitude of 70°. A dark segment of 10° altitude appeared at 3 a. m., the time of maximum brilliancy. The aurora disappeared at daybreak.

Duluth, Minnesota: shortly after midnight on the morning of the 30th a bright white auroral band was observed to start from azimuth 135° and pass across the sky to 10° above the horizon at azimuth 315°. This band was about a degree in width and continued well-defined and unbroken until 12.26 a. m., when it began to fade away and was succeeded by a pale greenish light, which increased in brilliancy and gradually assumed the form of an irregular arch. The aurora was visible until daylight.

Mount Washington, New Hampshire: an auroral light was seen at 9.20 p. m. of the 30th. Very brilliant streamers rose from near the horizon and disappeared at the zenith. The maximum brilliancy occurred at 10.30 p. m., when the summit of the mountain was brightly illuminated by the display; at that time the aurora extended from a few degrees north of east to five degrees north of west. Neither arch nor dark segment were seen during the display.

Fort Buford, Dakota: a brilliant aurora suddenly appeared in the eastern sky at 11.21 p. m. of the 30th. It was of a deep orange color, changing to a greenish hue near the base, from which arose numerous streamers to an altitude of 60°. The aurora extended over 45° of azimuth and disappeared at 11.44 p. m.

Boisé City, Idaho: a pale auroral light was observed about 1.30 a. m. of the 30th, extending from the northwest to the northeast.

Auroral displays were also observed during the month as follows:

1st.—Pekin, Illinois.

3d.—Clayton, New Jersey; North Lewisburg, Ohio.

4th.—New Haven and North Colebrook, Connecticut; Webster, Dakota; Spiceland, Indiana; Portland, Maine; Woodstock, Maryland; Amherst, Westborough, and Fall River, Massachusetts; Moorhead, Minnesota; Nashua, New Hampshire; Setauket, New York; Garrettsville, Ohio; Block Island, Rhode Island; Tatoosh Island, Washington Territory.

5th.—New Haven, Connecticut; Vevay, Indiana; Portland, Eastport, and Gardiner, Maine; Cambridge and Heath, Massachusetts; Mackinaw City, Escanaba, and Traverse City, Michigan; Mount Washington, New Hampshire; Setauket, New York; Block Island, Rhode Island; Embarras, Wisconsin.

9th.—Poplar River, Montana.

11th.—Tatoosh Island, Washington Territory.

19th.—North Lewisburg, Ohio.

20th.—New Haven, Connecticut; Clayton, New Jersey; Mountainville, New York.

23d.—Hiram, Ohio.

24th.—Tatoosh Island, Washington Territory; Sandusky, Ohio.

26th.—Garrettsville, Ohio; Cambridge, Massachusetts.

27th.—Poplar River, Montana; Fort Yates, Dakota.

28th.—Dudley, Massachusetts.

29th.—North Colebrook, Connecticut; Fort Yates, Fort Totten, Huron, and Webster, Dakota; Pekin, Illinois; Vevay, Indiana; Fort Madison, Des Moines, and Independence, Iowa; Eastport, Gardiner, Orono, and Bar Harbor, Maine; Amherst, Cambridge, Somerset, and Westborough, Massachusetts; Mackinaw City and Traverse City, Michigan; Moorhead, Minnesota; Nashua and Berlin Mills, New Hampshire; Atlantic City and Beverly, New Jersey; Cooperstown, Factoryville, Ithaca, Menand, Syracuse, Palermo, and Setauket, New York; Fallsington, Pennsylvania; Newport, Vermont; Prairie du Chien, Wisconsin.

30th.—Huron, Fort Meade, and Webster, Dakota; Pekin, Illinois; Eastport and Gardiner, Maine; Cambridge and Blue Hill Observatory, Massachusetts; Moorhead, Minnesota; Nashua and Berlin Mills, New Hampshire; Atlantic City, New Jersey; Post Mills, Vermont; Walla Walla, Washington Territory.

THUNDER-STORMS OF JUNE, 1886 (by Jr. Prof. H. A. Hazen).

The accompanying table gives the total number of storms recorded and studied; these are given by states and districts. Of the total number, 256 were from Signal Service, 492 from voluntary, and 1,534 from special thunder-storm observers.

The days of greatest frequency were the 2d, 13th, 14th, 16th, 24th, and 25th; days of least frequency were the 3d, 4th, 5th, 11th, 29th, and 30th. A marked feature has been the falling off in the number of storms for this month as compared with May, which had 2,734. This has been due to the drought in New England and parts of the west. An interesting feature brought out by this table is the evident progress of storms from district to district, *e. g.*, in district v, days of greatest number were the 6th, 14th, 20th; in district iii they were the 9th, 16th, 24th, or about three days later; in ii and i they were the 10th, 17th, 25th, or four days later than v.

Attention of observers is invited to a form of thunder-storm which may be called "stationary." The following is a description by N. T. Blackman, of Florence, Ohio: "July 14th we had what I call an electric storm, commencing about 10 p. m. and continuing until midnight, when all was calm. The storm came out of the northwest, and for two hours the thunder was terrific. It did not appear to travel past us, but hung right overhead for two hours, and the thunder and lightning were very severe. The last thunder was about midnight, and right overhead." Several records of this kind have been received, and it is hoped that observers will take particular pains to record those storms which do not appear to advance. It seems probable, from a slight investigation, that such storms occur very near the centre of low areas which have an exceedingly small motion of translation.

Attention is again directed to the point that it is exceedingly difficult to obtain the quarter from which a storm is coming while in the house, and special effort is desired that the direction of the storm be carefully determined.

Thunder-storms by districts, June, 1886.

District.	State.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.		Total.
I	Connecticut							1			2			1	3											3	1						11
	Maine		1	1				1			1	2														3				1			10
	Massachusetts										2					1										10	9	1					23
	New Hampshire			1						1																1		1					4
	New York		9					8			2				2	1	2	7	1							12	1						45
	Rhode Island																									1							1
	Vermont							4				1														2	1						8
	Total		10	2				14		1	7	3		1	5	2	2	7	1							27	17	1	1	1			102
II	Delaware																																
	Maryland									1	3				4			3					1		2	4							18
	New Jersey				1										6			7								5	1						20
	North Carolina			2				2	5	3	5							3							1	3	1	2	4	2	3		38
	Pennsylvania		3				1			1	6			1	5		1	4					1		3	9	2						37
	Virginia			5				6	4	9	6			4	8	1		8					2	1	14	6		3	1				78
	West Virginia		2							1	1			1											1	3							9
	Total		5	7	1		1	8	9	15	21			6	23	1	3	25					4	1	21	30	4	5	5	2	3		200
III	Illinois	8	5				2	1	5	2	5			3	11	8	11	6					1	15	8	4	1	3	3	3			105
	Indiana	2	9				1		1	1	6	1			8	3	3	3	1				1		2	5	4	3	3	2		1		50
	Kentucky									1					1														1				3
	Ohio	7	157	9	2	7	7	1	5	52	23	8	4	109	21	37	97	21		1	41	3	6	40	124	109	10	2		1			904
	Tennessee	5	4	3			1	2	7	6	3	1		7	2	2	3			1	5		3	5	2		1	7					70
	Total	22	175	12	2	10	9	9	15	70	27	9	7	136	34	53	109	22		2	47	4	26	58	134	113	17	15	3	2			1,142
IV	Michigan	2	1		1	2	5	1		1		3	5		2	11	7	2			1	4	5	5	7	4	2						71
	Minnesota	1			2				2			1	3	1	5		4			2	2	3			1		2						29
	Wisconsin	4			1											4	2				3	3	4		2		3	1					27
	Total	7	1		4	2	5	1	2	1		4	8	1	7	15	13	2		2	6	10	9	5	10	4	7	1					127
V	Dakota						2	5	4	1	1	7	3	1	6	1	3	2	7	5	2				1	1	1	1			3		57
	Iowa	24	4	1	15	10	54	5	15	4	1		9	12	78	15	49	1	16	9	36	35	7	12	4		12	28	30				846
	Nebraska	1		1			4	3	1			4	3	3	5	5	2		6	1	1	3		1	2	3		5	2				56
	Total	25	4	2	15	10	60	13	20	5	2	11	15	16	89	21	54	3	29	15	39	38	7	13	7	4	13	34	32		3		599
VI	Arkansas		2						2	2	1		2	2	1				3	1			1					2		1			20
	Indian Territory	1	1				1									1	1		1											1			7
	Kansas	16					5		5	1			4		3	7	13	4	9	5	3	7	1		2	5	9	2	5	2			108
	Missouri	22	3				1	1	2	2	1	1	4	1	5	3	8		1	3		1	3			5	4	3	1				75
	Total	39	6				7	1	9	5	2	1	10	3	9	11	22	4	11	11	4	8	5		2	10	13	7	6	4			210
	Grand total	93	201	23	32	22	82	46	85	97	59	28	40	163	167	103	203	63	41	30	96	60	51	77	174	188	71	63	47	9	6		2,380

CHART OF ELECTROMETER READINGS.

The first diagram of chart vi shows some of the results of simultaneous observations made at the Smithsonian Institution and at the office of the Chief Signal Officer. The distance between the two stations is slightly over one mile. The exposure at the office is that described in the MONTHLY WEATHER REVIEW for April. That at the Smithsonian Institution is from the north window of a tower on the north side of the building, the height of the collector above the ground being about fifty feet. The diagram shows observations made at both stations during the passage of a thunder-storm on June 17, 1886.

The morning was fair, with few cirro-stratus clouds moving from sw; wind sw., barometer low, and, at 9 a. m., a thunder-storm was predicted for the afternoon. The electrometer readings at the Signal Office were positive until 2.50 p. m., when they became negative. The wind was nw. and the weather threatening; rain beginning at 2.50 p. m.; ending in about one minute. Heavy rain began at 2.58, and at 3.44 the weather was clearing. At 3.38 the electrometer indications became positive in character and continued so until the last observation at 6 p. m. The values were greatest immediately after the passage of the storm.

The following notes were made at the Smithsonian Institution during the observations:

June 17, 1886:
3.21 10 p. m., lt. rain; distant thunder; wind nw., lt.
3.23 04–09 p. m., distant thunder; heavy rain.
3.25 13–28 p. m., thunder (near).
3.28 16–52 p. m., thunder.
3.34 20, 3.34 30–50 p. m., the first time, that of very vivid lightning-flash in the east; the second, that of the thunder and its duration.
3.43 30–48 p. m., thunder; wind s., light.
3.57 p. m., rain ended; storm far off in east.

The second diagram of chart vi represents a series of simultaneous observations made at the Signal Office and at the top of the Washington Monument—the distance between the two stations being about 3,500 feet, and the elevations respectively 45 and 500 feet above the ground. The observations were taken every five minutes, except between 11.30 a. m. and 12 m., and 1.30 p. m. and 2 p. m., when the interval was a minute. The day was a beautiful one, with the wind light,

from the northwest, a slight haziness, and a few small whitish cumulus clouds. There were hardly any noticeable changes throughout the day in these conditions. Compared with a series of observations made a few days previous (July 17th) the curve for the monument is remarkably quiet and even. On the date mentioned, the sky being cloudless and hazy, the wind from the sw., and no indication of rain, the values obtained exceeded at times 3,000 volts in a positive direction and averaged for the whole forenoon half this value, the needle oscillating almost continually. In the afternoon the indications were more steady and even, the values ranging under 1,000 volts. July 20th was a date on which no especial electrical activity might have been expected, and the curves in their general character show about as close a correspondence as might be looked for.

The third diagram represents the results of observations made during the passage of a thunder-storm at Ithaca, New York (the physical laboratory of Cornell University). The exposure at this place is such that in fair weather the average indications exceed 600 volts, while in stormy weather changes of more than 2,000 volts occur. On June 25th, in the early part of the forenoon, light showers occurred to the s. and sw. of the place of observation. The indications were steadily negative. At 5.30 p. m. dark cumulus clouds came up from the nw., wind light, and distant thunder audible. Here, as elsewhere, was noticed the sudden movement of the needle simultaneous with the flash of lightning. Rain commenced at 6.07 p. m; heavy rain in a few minutes. The following abbreviated table is from the observer's notes:

June 25, 1886:

6.05 00 p. m., thunder.
6.06 14 p. m., lightning.
15 p. m., thunder.
6.07 20 p. m., lightning.
6.08 00 p. m., thunder.
6.08 20 p. m., lightning.
6.09 00 p. m., heavy rain; torrents.
6.10 15 p. m., lightning.
6.10 20 p. m., thunder.
6.11 50 p. m., lightning.
6.12 35 p. m., lightning.
6.13 00 p. m., thunder.
6.13 10 p. m., lightning.
6.13 55 p. m., thunder.
6.14 10 p. m., lightning.
6.14 50 p. m., lightning.
6.15 30 p. m., lightning.
6.15 55 p. m., lightning.
6.16 15 p. m., thunder.
6.16 35 p. m., lightning.
6.17 00 p. m., lightning.
6.17 05 p. m., thunder.
6.17 35 p. m., lightning.
6.17 45 p. m., thunder.
6.18 10 p. m., lightning.
6.18 25 p. m., thunder.
6.18 56 p. m., lightning.
6.19 07 p. m., thunder.
6.19 25 p. m., lightning.
6.19 45 p. m., lightning.
6.20 00 p. m., thunder.
6.20 37 p. m., lightning.
6.20 50 p. m., thunder.
6.21 00 p. m., thunder.
6.21 40 p. m., lightning.
6.21 45 p. m., thunder very loud.
6.22 14 p. m., lightning.
6.22 35 p. m., lightning.
6.22 50 p. m., thunder.
6.23 00 p. m., lightning.
6.23 09 p. m., thunder.
6.23 20 p. m., lightning.
6.23 40 p. m., thunder.
6,24 10 p. m., lightning.
6.24 20 p. m., thunder.
6.24 45 p. m., sudden increase in rain.
6.27 10 p. m., lightning.
6.27 15 p. m., thunder.
6.28 15 p. m., lightning.
6.28 35 p. m., thunder.
6.29 00 p. m., lightning.
6.30 50 p. m., lightning.
6.31 30 p. m., lightning; distant thunder.
6.32 20 p. m., lightning.
6.00 45 p. m., lightning.
6.33 00 p. m., thunder.
6.33 35 p. m., a clinking sound heard in electrometer, probably sparkling.
6.34 05 p. m., ditto.
6.35 00 p. m., needle not oscillating.
6.36 00 p. m., lightning.
6.36 05 p. m., thunder.
6.36 30 p. m., rain diminishing.
6.38 20 p. m., lightning; clinking in electrometer.
6.39 10 p. m., thunder distant.
6.40 00 p. m., needle steady.
6.41 00 p. m., light rain.
6.42 00 p. m., storm past, but a dark cloud arising in southwest.
6.43 00 p. m., distant thunder.
6.43 20 p. m., lightning; distant thunder.
6.43 40 p. m., distant thunder.
6.46 00 p. m., clearing up in west.
6.47 00 p. m., dark cloud, sw., 2 miles; storm now in e.
6.48 00 p. m., thunder very distant.
6.48 20 p. m., lightning.
6.48 40 p. m., thunder.
6.49 00 p. m., rain ended.
6.50 00 p. m., dark cloud in ssw.
6.52 40 p. m., lightning.
6.52 50 p. m., thunder; raining in ssw.
7.00 00 p. m., distant thunder.
7.02 30 p. m., distant thunder.
7.17 00 p. m., last thunder heard.
7.20 00 p. m., very light rain and rainbow.

Observations at the summit of the Washington Monument (elevation 500 feet) during a thunder-storm.

July 14th, 1886, in the early part of the afternoon a thunder squall came up suddenly; at 2.45 p. m. the sky was covered with a pallium of stratus clouds, and distant thundering was audible; darker cumulus clouds came rapidly from the west, and by 3.15 p. m. the storm was overhead; two very vivid lightning flashes, with sharp and loud thunder, occurred about this time; at 3.40 p. m. the storm had passed. The collector was exposed from window on the south side, the height above the ground being about five hundred and five feet. When connected with the collector the needle was greatly excited, moving from one side to the other rapidly. The greatest deflection noticed showed a negative potential equivalent to about 3,000 volts. Sparks, however, were constantly passing between the wire-suspending fibre and the neck of the brass top-plate of the electrometer. In addition to the rapid oscillatory movements of the needle there was an up-and-down-jumping disturbance. As it was impossible to do anything with electrometer as then arranged, the wire connecting it with the collector was removed and a wire connected with the ground, held about $\frac{1}{8}$ inch away from the side of the collector. Sparks passed continuously at a rate of about 10 to 15 per second. By measurement the length of the spark was $\frac{5}{32}$ inch. There were two intense lightning flashes about 3.10 p. m. seemingly in close proximity to the monument. Simultaneously with the lightning the following phenomena were noticed: 1st, An alteration in the character of the stream of water issuing from the nozzle of the collector. Previous to the flash, and apparently depending upon the degree of electrification, the stream would be twisted and split into many fine threads and sprays; but instantly, with the occurrence of the flash, the stream resumed its normal character, maintaining it for a few seconds and then gradually becoming more and more distorted until the occurrence of another flash, when the same state of things was repeated. 2d, There was noticed a cessation of the sparking between the collector and the ground-wire, simultaneously with the flash. Then long before thunder was heard (in one case eight seconds) the sparking would again begin and increase rapidly. At 3.40 p. m. the storm appeared to be over, and at this time the electrometer indications were positive and much more constant.

OPTICAL PHENOMENA.

SOLAR HALOS.

Solar halos were observed in the various states and territories during the month, as follows:

Alabama.—Mobile, 26th.
Arizona.—Yuma, 3d; Prescott, 10th.
Arkansas.—Lead Hill, 3d.
Colorado.—Montrose, 20th, 29th.
Connecticut.—New Haven, 1st.
Dakota.—Webster, 19th; Fort Buford, 25th, 29th.
District of Columbia.—Washington City, 21st.
Florida.—Key West, 10th, 12th, 23d; Archer, 10th, 15th, 21st, 29th.
Georgia.—Atlanta, 2d.
Idaho.—Boisé City, 13th.
Illinois.—Cairo, 6th; Riley, 8th, 10th, 19th; Springfield, 19th; Chicago, 28th; Pekin, 30th.
Indiana.—Jeffersonville, 6th; Vevay, 12th, 19th, 25th; Indianapolis, 15th; Greencastle, 16th.
Iowa.—Cedar Rapids, 2d, 5th; Keokuk and Davenport, 19th; Corydon, 27th.
Kansas.—Wakefield, 3d.
Kentucky.—Frankfort, 6th.
Maine.—Portland, 9th, 14th, 22d; Cornish, 9th, 22d.
Maryland.—Baltimore, 20th, 21st.
Massachusetts.—Amherst, 1st; Blue Hill Observatory, 1st, 11th, 22d.
Michigan.—Escanaba, 6th; Grand Haven, 7th.
Minnesota.—Saint Vincent, 24th.
Missouri.—Saint Louis, 3d.
Montana.—Poplar River, 7th.
Nebraska.—Valentine, 10th; De Soto, 26th.

New Jersey.—Egg Harbor City, 20th; Atlantic City, 21st; Dover, 21st, 27th.
New York.—Albany, 1st, 11th; Oswego, 9th, 11th, 20th; Palermo, 9th, 11th, 22d; Ithaca, 11th; Buffalo, 14th, 15th, 20th; Mountainville and Syracuse, 20th.
North Carolina.—Fort Macon, 5th, 23d; Kitty Hawk and Weldon, 21st; Smithville and Wilmington, 23d.
Ohio.—Wauseon, 4th, 5th, 8th, 19th to 23d, 27th, 28th; Garrettsville, 20th; Toledo, Westerville, and Tiffin, 27th.
Oregon.—Roseburg, 9th; East Portland, 19th.
Pennsylvania.—East Brook, 3d, 11th, 20th, 21st, 25th, 27th; Philadelphia, 9th, 21st; Pittsburg, 21st; Erie, 27th.
South Carolina.—Stateburg, 7th, 20th, 23d, 27th, 28th.
Tennessee.—Nashville, 1st, 5th, 9th, 12th, 19th, 21st, 27th; Chattanooga, 1st, 30th.
Texas.—Fort Stockton, 11th.
Vermont.—Strafford, 9th, 11th, 22d.
Virginia.—Lynchburg, 2d, 20th; Fort Myer, 4th, 6th, 21st; Variety Mills, 6th, 13th, 21st; Dale Enterprise, 4th, 19th, 21st, 29th; Cape Henry, 21st.
Washington Territory.—Port Angeles, 5th, 23d, 25th; Walla Walla, 9th, 18th; Tatoosh Island, 23d.
Wyoming.—Fort Bridger, 20th, 24th, 30th.

LUNAR HALOS.

Lunar halos were observed in the various states and territories during the month, as follows:
Alabama.—Birmingham, 10th; Mobile, 12th, 13th.
Arkansas.—Fort Smith, 6th, 16th.
California.—Salinas, 8th; Fort Bridger, 20th.
Colorado.—Pike's Peak, 17th.
Connecticut.—New London, 21st.
District of Columbia.—Washington City, 11th, 13th.
Florida.—Sanford, 7th, 14th; Cedar Keys, 10th, 14th, 16th; Archer, 14th; Jacksonville, 14th, 15th; Key West, 17th.
Georgia.—Atlanta, 10th; Augusta, 15th.
Illinois.—Cairo, 6th, 9th; Windsor, 7th, 12th; Pekin, 7th, 18th; Sycamore, 10th; Riley, 10th, 12th; Springfield, 12th.
Indiana.—Jeffersonville, 9th, 12th; Greencastle, Indianapolis, and Terre Haute, 12th.
Indian Territory.—Fort Sill, 16th.
Iowa.—Des Moines, 12th.
Kansas.—Sterling and El Dorado, 15th.
Kentucky.—Frankfort, 7th, 8th, 9th, 12th; Louisville, 10th.
Louisiana.—New Orleans, 12th, 13th; Grand Coteau, 18th.
Maine.—Orono, 12th.
Massachusetts.—Amherst, 20th; Boston, 22d.
Michigan.—Grand Haven, 6th.
Minnesota.—Moorhead, 10th; Saint Vincent, 23d.
Missouri.—Saint Louis, 7th.
Nebraska.—De Soto, 11th.
New Hampshire.—Nashua, 22d.
New Jersey.—Egg Harbor City, 11th; Atlantic City, 11th, 12th.
New York.—Ithaca, 13th, 20th.
North Carolina.—Kitty Hawk, 6th.
Ohio.—Cleveland, 13th; Napoleon, 15th.
Rhode Island.—Block Island, 11th, 21st.
South Carolina.—Spartanburg, 7th, 8th, 9th, 13th, 15th; Stateburg, 7th, 8th, 10th, 13th.
Tennessee.—Milan, 5th, 19th; Paris, 6th, 9th, 12th; Nashville, 7th, 10th; Austin and Chattanooga, 10th; Ashwood, 12th.
Texas.—Galveston and Rio Grande City, 9th; Brownsville, 10th; Cleburne and Palestine, 11th, 12th; Fort Elliott, 12th, 13th; Corsicana, 13th; San Antonio, 14th.
Virginia.—Cape Henry, 7th, 8th; Bird's Nest, 8th; Lynchburg, 9th, 11th, 13th; Variety Mills, 13th; Dale Enterprise, 21st.

The phases of the moon (Washington mean time) during June, as given in "The American Ephemeris and Nautical Almanac" for 1886, are as follows: New moon, 1st, 20 h. 47.1 m.; first quarter, 8th, 14 h. 18.5 m.; full moon, 15th, 20 h. 30.6 m.; last quarter, 23d, 23 h. 26.6 m.; apogee, 20th, 23.8 h.; perigee, 5th, 5.7 h.

MIRAGE.

Webster, Dakota, 3d, 4th, 5th, 9th, 11th.
Duluth, Minnesota, 7th.
Port Angeles, Washington Territory, 13th.
Egg Harbor City, New Jersey, 20th.

MISCELLANEOUS PHENOMENA.

DROUGHT.

Key West, Florida: on the 6th 1.08 inches of rain fell, breaking the drought which had prevailed since May 1st.

Lamar, Missouri: the severe drought which had prevailed in this vicinity was broken on the 12th by a heavy rain which was of great value to crops. Farmers claim that the rain destroyed the chinch bug, which had previously existed in large numbers.

Owatonna, Steele county, Minnesota, 15th: crops were beginning to suffer serious injury from drought, wheat in many fields having turned yellow.

Geneva, New York, 18th: in the region between Seneca Lake and Lake Erie very little rain fell during the first half of the month. The ground was very dry and hard, not having enough moisture in places to germinate seed.

Gardiner, Kennebec county, Maine: on the 26th and 27th 1.10 inches of rain fell, greatly benefiting vegetation which had been suffering from drought, only 0.74 inch of rain having fallen from the 1st to the 26th.

Fort Madison, Lee county, Iowa, 30th: very little rain has fallen during the month; pastures and meadows are suffering from drought.

Cedar Rapids, Linn county, Iowa, 30th: the month has been exceptionally hot and dry, the monthly rainfall amounting to only 1.25 inches.

Des Moines, Iowa, 30th: crops in this vicinity were suffering from a drought as no heavy rains had fallen during the month. Wheat ripened before it was matured in consequence of the continued heat and lack of moisture.

Fargo, Cass county, Dakota, 30th: reports from nearly all parts of the territory indicate an extensive and severe drought.

Mandan, Morton county, Dakota, 30th: the continued dry weather had seriously injured the wheat crop.

Abilene, Texas, 30th: the dry weather still continues and is having a damaging effect on agricultural and stock-raising interests. Thousands of sheep have died from want of water and grass.

Geneseo, Henry county, Illinois, 30th: in this vicinity dry weather has prevailed throughout the month, ruining pasturage on the uplands.

Birmingham, Oakland county, Michigan, 30th: severe drought prevailed in this vicinity during the month.

Madison, Wisconsin: at the end of the month crops were much damaged from lack of moisture. A drought which had continued throughout the month had so injured crops that the yield will be much diminished. Winter wheat was prematurely ripened and corn was turning yellow.

EARTHQUAKES.

Port Antonio, Jamaica: on the 2d two shock of earthquake were felt, of about twenty seconds' duration. No damage was done.

San Francisco, California: on the 7th, at 4.13 p. m., a slight trembling motion of the earth was felt, followed by a sharp shock of about ten seconds' duration.

Oakland, California: on the 7th, at 1.31 p. m. (local time), a sharp shock of earthquake was felt. Windows were rattled and hanging objects were swayed back and forth in the direction of the vibrations, which were from west to east.

Antigua, West India Islands: sharp shocks of earthquake were felt on this island, and also at Saint Kitt's, on the 10th.

The following is from the Portland, Maine, "Daily Press," of June 12, 1886:

LONDON, *June* 11.—The latest advices from Auckland, New Zealand, state that the volcanic eruption at Tera-Wera destroyed entire villages in the district by swiftly burying them in ashes. The surface of the earth for many miles around the active volcano was disturbed by the earthquake which accompanied the eruption. Twenty-six dead bodies have already been recovered from the ruins.

FOREST AND PRAIRIE FIRES.

Eau Claire, Eau Claire county, Wisconsin: reports from the lumber districts bordering on the Flambeau, Deer Tail, Soft Maple, and other streams, state that disastrous forest fires had been burning in those districts during May 30th and 31st and June 1st. The fires were extinguished by a copious rainfall during the afternoon of the 1st.

Pentwater, Oceano county, Michigan: from the 1st to the 5th, inclusive, disastrous forest fires prevailed in this vicinity. The forests were also burning on the 30th.

Los Angeles, California: on the 18th, at San Fernando, 2,000 acres of wheat were destroyed by fire. On the 30th three hundred acres of wheat were burned at Athlone.

Saint John, New Brunswick: during June the province has been suffering from drought, and on the 23d forest fires were burning along the line of the Inter-colonial railroad. Considerable damage was done at the stations of Berry's Mills and Painsic Junction.

Saint Vincent, Minnesota: prairie fires, 5th, 6th.
Thornville, Michigan: forest fire, 17th.
Fort Bowie, Arizona: forest fire, 21st.
Linkville, Oregon: forest fire, 21st.

INSECTS.

Cameron, Milam county, Texas, 4th: reports from the interior of this county state that grasshoppers have appeared in large numbers and crops are being destroyed by them.

Rochester, New York, 12th: the black and white aphis have been doing great damage to plum and cherry trees throughout western New York; scarcely a tree in this section has escaped injury.

Guilford, Connecticut, 19th: cut worms have completely destroyed the onion crop; the loss in this town is heavy and would have been greater had the worms appeared earlier in the season.

Vandalia, Fayette county, Illinois, 28th: in the eastern and southeastern parts of this county chinch-bugs have become very numerous and destructive.

Rome, Oneida county, New York, 30th: reports from Oswego county state that the hop vine, which is cultivated generally throughout that section, is covered with the aphis, or plant louse. A varnish-like substance, called by the farmers "honey-dew," is also found wherever the lice are and is as destructive as the vermin. The leaves and other parts of the vine attacked by the lice and honey-dew curl up, and mould follows before the hop blossoms mature.

Syracuse, New York, 30th: fruit trees in this vicinity have been attacked by the black aphis, accompanied by the blight called honey-dew.

Hillsborough, Montgomery county, Illinois, 30th: chinch-bugs have appeared in this section in large numbers, and are doing considerable damage to crops, especially corn.

Poplar River, Montana, 30th: owing to the prevailing drought grasshoppers and potato bugs are becoming very numerous and destructive.

METEORS.

Sterling, Rice county, Kansas: on the 8th, at 10 p. m., a very large and bright meteor was seen moving across the southern portion of the sky; it moved very swiftly and exploded with a loud report.

Fort Elliott, Texas: a meteor was observed at 10.25 p. m. of the 8th. It started at an altitude of about 35° in the eastern sky and burst when 3° above the earth; no report was heard, but fragments were seen flying off in all directions.

Cahuenga, Los Angeles county, California: on the 18th, at 8.33 p. m., a meteor started from a point due south, about 10° above the horizon, and moved toward the east, where it disappeared at an elevation of about 30°. It was equal in brilliancy to a star of the second magnitude.

Meteors were also reported, as follows:
Dover, New Jersey, 1st.
Vevay, Indiana, 1st.
Cairo, Illinois, 5th.
Sterling, Kansas, 8th.
Davenport, Iowa, 9th.
Milan, Tennessee, 11th.
Lead Hill, Arkansas, 11th, 23d, 26th, 28th.
Manatee, Florida, 17th.
Salt Lake City, Utah, 17th.
Cleburne, Texas, 18th, 20th.
Monticello, Iowa, 20th.
Egg Harbor City, New Jersey, 20th, 28th, 29th.
Mountainville, New York, 26th, 27th, 29th.
Wauseon, Ohio, 27th.
Limona, Florida, 28th.
Clayton, New Jersey, 29th.

MIGRATION OF BIRDS.

Geese flying northward.—Rio Grande City, Texas, 6th.
Ducks flying northward.—Saint Vincent, Minnesota, 8th.

POLAR BANDS.

Polar bands were reported during the month by the following stations:
Nashville, Tennessee, 4th, 10th, 19th.
Cairo, Illinois, 17th.
Prescott, Arizona, 3d.
Archer, Florida, 16th.
Ninnescah, Kansas, 1st, 6th, 18th.
Gardiner, Maine, 29th.
Amherst, Massachusetts, 4th, 29th.
Syracuse, New York, 30th.
Wauseon, Ohio, 13th, 30th.
Yellow Springs, 4th.
Napoleon, Ohio, 10th, 26th.
Wytheville, Virginia, 30th.

SAND STORMS.

Abilene, Texas, 29th.
Yuma, Arizona, 10th, 11th, 12th, 24th.
Maricopa, Arizona, 2d, 11th.
Fort McDowell, Arizona, 8th.
Fort Huachuca, Arizona, 7th.

SUN SPOTS.

Prof. David P. Todd, director of the Lawrence Observatory, Amherst, Massachusetts, furnishes the following record of sun spots for June, 1886:

Date—June, 1886. Standard time.	No. of new.		Disappeared by solar rotation.		Reappeared by solar rotation.		Total No. visible.		Remarks.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	
1, 1 p. m.	0	0	.....	.....	0	0	3	10‡	
4, 9 a. m.	1	60‡	.....	.....	.....	.....	3	80‡	
5, 5 p. m.	0	15‡	0	0	0	0	3	95‡	
6, 5 p. m.	1	10‡	0	5‡	0	0	4	100‡	
7, 6 p. m.	0	0	1	5‡	0	0	3	95‡	
8, 6 p. m.	1	3	1	10‡	1	3	3	70‡	
10, 3 p. m.	0	0	.....	.....	.....	.....	2	12	
16, 3 p. m.	1	1	.....	.....	.....	.....	1	1	
20, 3 p. m.	3	11	0	0	.....	.....	4	12	
27, 10 a. m.	.....	.....	.....	.....	.....	.....	5	20‡	Spots mostly small.
28, 4 p. m.	1	3	0	0	1	3	5	20‡	
30, 9 a. m.	0	40‡	.....	.....	.....	.....	3	55‡	

Faculæ were seen at the time of every observation. ‡Approximated.

Mr. H. D. Gowey, of North Lewisburg, Champaign county, Ohio, reports having observed sun spots on the following dates: 1st, 3d to 8th, 11th, 12th, 17th, 19th, 23d to 26th, 28th, 29th, 30th.

SUNSETS.

The characteristics of the sky, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from one hun-

dred and fifty-one stations show 4,510 observations to have been made, of which five were reported doubtful; of the remainder, 4,605, there were 3,844, or 83.5 per cent., followed by the expected weather.

WATER-SPOUTS.

The steamship "Clement," Thomas Burley, commanding, reports: in N. 19° 29′, W. 59° 14′, at 22 h. 26 m., Greenwich mean time of June 4th, saw three large water-spouts, moving in a ssw. direction.

Steamship "Stroma," reports: June 4th, in N. 32° 38′, W. 75° 35′, passed two water-sponts to the westward, one of which rushed in close proximity to the vessel.

Indianola, Texas: on the 8th a water-spout passed over Powder Horn Lake, a small body of water lying west of the town.

VERIFICATIONS.

INDICATIONS.

In the table below are shown the percentages of indications verified for the months July to October, 1885, inclusive. The percentages for July and August, 1885, as published in the MONTHLY WEATHER REVIEW for those months, have been revised, with results as given in this table. The percentages for October and November, 1885, have not been published previously. The indications for July, eighteen days of August, and for September were verified by 2d Lieutenants Joseph S. Powell and J. E. Maxfield, Signal Corps, U. S. Army, Assistants, and Prof. Cleveland Abbe, Assistant; the remaining thirteen days of August were verified by 1st Lieut. H. H. C. Dunwoody, 4th Artillery, Acting Signal Officer and Assistant, 2d Lieut. W. A. Glassford, Signal Corps, U. S. Army, Assistant, and Prof. Cleveland Abbe, Assistant. The indications for October were verified by 1st Lieut. T. M. Woodruff, 5th Infantry, Acting Signal Officer and Assistant, and 2d Lieut. W. A. Glassford, Signal Corps, U. S. Army, Assistant:

Percentages of indications verified—July to October, 1885.

	July.	August.	September.	October.
By districts:	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
New England	68.58	72.79	82.24	75.84
Middle Atlantic states	74.01	73.86	80.60	79.85
South Atlantic states	79.39	76.51	83.97	88.35
East Gulf states	83.27	75.80	80.72	84.65
West Gulf states	80.95	73.56	81.72	81.75
Lower lake region	70.89	75.00	76.13	77.43
Upper lake region	73.53	72.57	75.07	74.13
Tennessee and Ohio Valley	72.84	74.55	75.49	80.42
Upper Mississippi valley	73.01	76.32	76.45	77.54
Missouri Valley	71.60	70.65	73.06	77.52
North Pacific coast region	88.45	91.37	82.59	66.95
Middle Pacific coast region	92.69	91.23	89.73	80.75
South Pacific coast region	95.47	93.57	93.60	91.38
By elements:				
Weather	78.56	79.84	86.61	84.53
Wind	74.59	70.30	75.52	77.11
Temperature	78.86	80.00	77.22	76.66
Barometer	82.78	87.08	81.51	81.59
General averages	77.44	76.90	79.93	79.69

The detailed comparison of the tri-daily indications for June, 1886, with the telegraphic reports for the succeeding thirty-two hours, shows the general average percentage of verifications to be 73.07. The percentages for the different elements are: Weather, 77.71; wind, 67.66; temperature, 73.86. By states, etc., the percentages are: For Maine, 67.22; New Hampshire, 67.50; Vermont, 67.13; Massachusetts, 67.69; Rhode Island, 69.54; Connecticut, 70.74; New York, 75.37; Pennsylvania, 73.15; New Jersey, 77.96; Delaware, 78.52; Maryland, 77.59; Virginia, 77.69; North Carolina, 75.28; South Carolina, 76.11; Georgia, 78.61; Florida, 69.17; Alabama, 76.57; Mississippi, 78.52; Louisiana, 76.11; Texas, 77.59; Arkansas, 73.33; Tennessee, 76.76; Kentucky, 70.65; Ohio, 73.70; West Virginia, 65.19; Indiana, 70.83; Illinois, 73.13; Michigan, 73.41; Wisconsin, 70.09; Minnesota, 70.00; Iowa, 66.02; Kansas, 69.91; Nebraska, 71.67; Missouri, 72.86; Colorado, 78.89; east Dakota, 72.99; north Pacific coast region, 68.75; middle Pacific coast region, 79.76; south Pacific coast region, 81.99.

There were eight omissions to predict, out of 9,864, or 0.01 per cent. Of the 9,856 predictions that have been made, eight hundred and ninety-six, or 9.09 per cent., are considered to have entirely failed; five hundred and ninety-four, or 6.03 per cent., were one-fourth verified; 1,893, or 19.21 per cent., were one-half verified; 1,463, or 14.84 per cent., were three-fourths verified; 5,010, or 50.83 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

CAUTIONARY SIGNALS.

During June, 1886, there were fifty-nine signals of various kinds ordered, of which number, eleven, or 20.34 per cent., were fully justified both as to direction and velocity. Of the signals above mentioned twenty-one were ordered for northeasterly winds; of these, four, or 19.05 per cent., were justified both as to direction and velocity, and twelve, or 57.14 per cent., were justified as to velocity only. Sixteen signals were ordered for southeasterly winds, and two, or 12.50 per cent., were justified both as to direction and velocity. Seven signals were ordered for southwesterly winds, and three, or 42.86 per cent., were justified both as to direction and velocity. Thirteen signals were ordered for northwesterly winds; of these, two, or 15.38 per cent., were justified both as to direction and velocity, and three, or 23.08 per cent., were justified as to velocity only. Two cautionary signals were ordered (for no specified direction) and neither was justified.

In twenty-two cases winds were reported which would have justified signals had they been displayed.

COLD-WAVE SIGNALS.

No cold-wave signals were ordered during June.

RAILWAY WEATHER SIGNALS.

Prof. P. H. Mell, jr., director of the "Alabama Weather Service," in the report for June, 1886, states:

The verifications of predictions for the whole area was 93 per cent. for temperature, and 87 per cent. for weather.

The following corporations comprise this system: South and North; Montgomery and Mobile; Mobile and Girard; Georgia Pacific; East Tennessee, Virginia and Georgia system in Alabama; Memphis and Charleston; Columbus and Western; Atlanta and West Point of Georgia; Northeastern of Georgia; Western and Atlantic; East Tennessee, Virginia and Georgia system in Georgia; Montgomery and Eufaula; Pensacola and Selma; Pensacola and Atlantic; and the cities of Milledgeville, Georgia, and Talladega, Alabama.

LOCAL WEATHER SIGNALS.

Prof. Winslow Upton, director of the "New England Meteorological Society," in the report for June, 1886, states:

The verification of weather signals at New Haven was 83 per cent. for temperature, 93 for weather; at fourteen other stations reporting to the secretary, 92.3 for temperature, 83.5 for weather. Local predictions made at Blue Hill gave 70 per cent. for rains, 90 for weather.

Prof. Goodwin D. Swezey, director of the "Nebraska Weather Service," in the report for June, 1886, makes the percentage of verifications for temperature in the state 86.7, and weather 82.7.

Meteorological record of voluntary observers and Army post surgeons, June, 1886.

The maximum and minimum temperatures at stations marked thus (*) are from readings of other than standard instruments.

Stations.	Temperature.			Rainfall.	Stations.	Temperature.			Rainfall.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
Alabama.	°	°	°	*Inches*	*California*—Cont'd.	°	°	°	*Inches*
Birmingham *	92	60	76.0	7.08	Cahuenga				0.00
Greensborough	88	66	76.0	6.73	Gaston, Fort	98	43	67.4	0.00
Mount Vernon B'ks.	96	63	78.8	7.41	Hydesville				0.00
Arizona.					Mason, Fort	76	53	62.3	0.00
Huachuca, Fort	101	47	76.0	0.00	Murietta *	98	48	65.0	0.00
Lowell, Fort	110	52	86.7	0.00	Nicolaus *	100	56	75.4	0.00
McDowell, Fort	113	52	88.6	0.00	Oakland	79	53	60.8	0.00
Arkansas.					Oroville *	95	62	79.1	0.00
Lead Hill *	101	52	75.4	5.43	Poway *	95	60	67.2	0.00
California.					Presidio of San F	77	45	57.0	0.00
Alcatraz Island	72	48	56.0	0.00	Princeton *	103	51	73.4	0.00
Angel Island	93	51	63.8	0.00	Sacramento*	99	51	72.3	trace.
Benicia Barracks	86	55	67.9	0.00	Salinas	71	51	57.0	0.00
Bidwell, Fort	92	33	65.3	0.78	Susanville	93	47	66.0	1.22

Meteorological record of voluntary observers, etc.—Continued.

Stations.	Temperature. Maximum.	Minimum.	Mean.	Rainfall.
Colorado.	°	°	°	*Inches*
Colorado Springs	85	45	64.4	3.06
Lewis, Fort	86	36	61.7	0.32
Connecticut.				
Bethel				2.51
Hartford	85	42	63.1	1.97
North Colebrook *	78	43	59.0	1.19
Voluntown	83	54		1.65
Dakota.				
Abr. Lincoln, Fort	96	41	66.8	2.20
Meade, Fort	95	45	67.1	0.90
Pembina, Fort	91	26	63.3	3.60
Randall, Fort	99	37	69.5	2.02
Richardton	88	48	68.9	2.80
Sisseton, Fort	88	36	65.2	2.72
Sully, Fort	100	44	70.5	4.29
Totten, Fort	90	35	64.7	3.14
Vermillion	91	40		2.55
Webster	95	42	68.9	
Yates, Fort	96	41	68.4	2.20
District of Columbia.				
Distributing Res'r*	89	55	73.0	7.11
Receiving Res'v'r*	90	58	74.0	6.07
Rock Creek Bridge*	94	56	74.8	
Florida.				
Alva*	93	68	76.6	11.40
Archer *	92	66	79.8	12.55
Limona *	102	69	80.3	11.62
Manatee *	96	70	83.1	11.14
Meade, Fort				6.80
Merritt's Island	93	42	79.0	6.70
St. Augustine, Fort	94	66	78.8	4.67
Tallahassee *	92	72		7.75
Georgia.				
Athens	87	60	73.4	9.08
Forsyth*	91	66	76.4	11.14
Milledgeville	94	64	77.9	10.97
Idaho.				
Boisé Barracks	99	40	71.9	0.32
Cœur d'Alene, Fort	88	38	63.4	1.51
Illinois.				
Anna *	93	53	73.7	3.84
Bloomington	88	49		3.71
Collinsville	89	42	70.9	6.55
Charleston*	92	41	71.5	2.69
Geneseo *	89	43	73.6	0.54
Mattoon *	94	56	73.0	3.67
Pekin *	95	47	73.5	1.99
Peoria	95	48	74.2	3.67
Riley	89	42	65.5	1.89
Rockford*	88	50	67.2	2.74
Sandwich	92	49	68.8	1.28
South Evanston	89	40	64.8	1.30
Sycamore	88	52	66.2	2.27
Windsor	95	48	72.7	6.89
Indian Territory.				
Gibson, Fort	99	54	74.6	3.00
Reno, Fort	101	48	74.8	2.86
Supply, Fort	98	48	73.7	3.54
Indiana.				
Butlerville *	90	52	73.4	8.51
Fort Wayne*	92	45	69.6	6.00
Connersville*	88	53	68.3	5.53
Jeffersonville	90	50	71.8	5.14
Laconia	95	47	72.5	5.36
Lafayette	93	39	68.9	2.00
La Grange	88	42	66.7	4.56
Logansport*	92	44	72.2	4.45
Mauzy	88	37	66.9	8.34
Monticello	89	48	68.8	
Spiceland	93	42	67.5	6.01
Sunman*	87	46	71.3	6.68
Terre Haute*	85	56		2.36
Vevay	86	51	70.5	7.39
Iowa.				
Bancroft	95	40	66.4	1.32
Cedar Rapids *a* *	94	43	71.1	1.25
Cedar Rapids *b* *	93	34	63.4	
Corydon	93	35	71.9	0.90
Des Moines	96	40	68.7	
Independence *	88	52	69.0	1.69
Logan	98	40	70.7	3.30
Fort Madison	93	50		0.85
Manchester*	90	42	68.0	1.54
Monticello *	95	36	68 9	1.41
Mount Vernon*	98	48	73.2	
Oskaloosa *a*	98	44	72.2	0.62
Oskaloosa *b*	93	50		
West Union *	95	46	66.8	1.77
Kansas.				
Allison	96	54	72.1	6.39
Atchison *	93	54	71.9	3.05
Belleville	94	65	81.0	1.68
El Dorado	92	48	71.1	3.70
Elk Falls				3.59
Hays, Fort	98	43	69.7	3.60
Independence *	96	54	72.9	2.23
Lawrence	92	49	71.8	3.71
Manhattan	100	55	72.3	5.40
Ninnescah	95	57	74.1	7.61
Riley, Fort	100	47	76.0	2.98
Fort Scott*	98	56	75.5	3.99
Sterling	95	54	71.5	5.03
Kansas—Cont'd.				
Topeka	96	54	71.1	4.03
Wakefield *	99	54	73.5	4.12
Wellington	91	54	71.2	7.71
Westmoreland*	96	43	73.0	3.37
Wyandotte	94	46	70.0	4.20
Kentucky.				
Frankfort	89	49	71.8	5.01
Louisiana.				
Grand Coteau	92	69	78.7	11.31
Liberty Hill	90	77	85.5	6.26
Luling *	92	67		4.11
Maine.				
Bar Harbor	78	45		1.75
Buckfield *				1.71
Cornish *	85	51	62.9	2.19
Gardiner	81	44	61.1	1.84
Orono *	83	46	61.6	2.74
Maryland.				
Cumberland	82	45	67.2	4.02
Fallston*	86	51	66.8	5.25
Great Falls*	88	57	71.8	4.98
McDonogh	85	51	69.1	4.01
McHenry, Fort	85	54		6.08
Woodstock	87	44	67.9	4.54
Massachusetts.				
Amherst *a*	82	51	63.5	1.80
Amherst *b*	82	42	63.2	2.33
Blue Hill Obs'y	81	48	61.1	1.52
Deerfield	88	40	63.4	
Dudley	86	49	64.0	1.29
Fall River	80	50	63.3	1.38
Heath*	84	42		
Milton	82	50	61.9	1.56
New Bedford	79	45	62.8	2.08
Princeton	79	45	60.9	1 86
Quincy*	83	43	72.0	1.70
Somerset *	89	50	67.6	1.39
Taunton	85	40	64.0	1.33
Worcester	77	52	61.1	2.15
Westborough	86	41	65.7	1.63
Williamstown	76	42	62.3	2.72
Michigan.				
Birmingham	89	41		1.82
Brady, Fort	86	33	58.8	3.12
Harrisville*	85	33		5.01
Hudson	95	37		3.48
Kalamazoo	88	46		2.98
Lansing	91	40	66.2	2.14
Mottville				1.75
Pentwater	93	27	59.2	0.44
Thornville	92	44	66.8	1.92
Traverse City *	90	34		0.97
Minnesota.				
Minneapolis	91	48	66.5	5.35
Snelling, Fort	94	41	67.4	4.52
Missouri.				
Carthage	98	51	75.6	5.60
Central College*	93	49	73.1	5.40
Conception *	89	50	71.1	2.12
Pierce City	93	50	71.1	7.40
Warrenton *	90	56	72.1	
Montana.				
Assinaboine, Fort	94	48	68.7	0.86
Ellis, Fort	97	32	61.8	2.83
Keogh, Fort	101	41	71.3	2.28
Missoula, Fort	86	43	62.4	1.58
Shaw, Fort	91	36	65.2	1.64
Nebraska.				
Brownville	93	49	70.1	
Crete	90	42	68.7	6.10
De Soto *	95	40	71.9	1.62
Fairbury	97			3.97
Fremont *	94	44	69.0	2.89
Genoa	92	42	69.3	3.24
Hay Springs *		33	63.9	2.66
Marquette				2.23
Niobrara, Fort	99	42	69.4	2.04
Robinson, Fort	92	41	67.7	1.91
Sidney, Fort	93	39	64.6	0.52
Stockham	92			3.55
Nevada.				
Halleck, Fort	92	31	62.4	0.38
McDermit, Fort	95	33	65.2	0.82
New Hampshire.				
Antrim				3.05
Ashland				2.77
Belmont				2.67
Berlin Mills	91	32		1.38
Bristol				2.70
Hanover	82	50		2.44
Lake Village				2.33
Nashua	85	41	63.5	1.79
Wier's Bridge				2.38
Wolfborough				2.70
Woodstock				2.30
New Jersey.				
Beverly *	90	52	67.8	3.83
Clayton *	91	47	67.3	2.32
Dover *	83	41	64.6	2.54
Egg Harbor City	90	40	66.9	5.79
Phillipsburg				3.31
Readington*	88	58	71.2	

Meteorological record of voluntary observers, etc.—Continued.

Stations.	Temperature. Maximum.	Minimum.	Mean	Rainfall.
New Jersey—Cont'd.	°	°	°	*Inches*
Roseland				3.91
South Orange	86	56	65.4	2.50
Upper Montclair	80	48	64.4	5.17
Vineland	86	53	70.0	2.28
New Mexico.				
Bayard, Fort	96	52	73.8	1.16
Gallinas Spring	95	51		5.04
Puerto de Luna	94	56	71.7	1.09
Union, Fort	90	41	65.8	1.66
Selden, Fort	107	55	80.5	0.62
Wingate, Fort	92	42	67.9	0 34
New York.				
Auburn	71	54	63.6	3.53
Columbus, Fort	83	51	65.7	3.24
Cooperstown *	79	44	60.8	3.01
David's Island	82	49	65.2	2.82
Factoryville*	88	42	65.1	1.87
Humphrey *	90	47	61.1	2.76
Ithaca	90	41	65.5	2.28
Madison Barracks	84	42	64.5	1.08
Menand Station	80	56	65.3	2.39
Mountainville	82	41	63.9	2.91
Niagara, Fort	84	42	63.4	1.67
North Volney *	85	49	63.3	
Palermo*	82	46	61.7	3.44
Palmyra*	90	51	68.1	
Penn Yan				2.40
Plattsburg B'ks	84	46	63.2	4.72
Setauket	80	49	63.8	3.72
Syracuse	81	50		
West Point	84	45	66.9	3.60
White Plains	78	54	65.8	4.12
North Carolina.				
Chapel Hill	93	54	75.3	6.22
Lenoir	84	57		8.00
Lincolnton	85	60	70.6	8.43
Raleigh	91	63	75.0	4.80
Reidsville *	97	38	66.4	8.88
Statesville*	91	61	73.0	6.26
Weldon *	94	61	73.2	6.75
Ohio.				
Cleveland	90	44	65.8	1.22
Clyde	92	59	71.6	1.50
College Hill*	97	54	72.0	7.75
Elyria	89	46		2.64
Fostoria *	93	49	68.8	3.08
Garrettsville	89	33	61.4	2.35
Hiram	88	47	65.2	2.58
Jacksonborough*	94	48	67.4	6.25
Napoleon	91	43	69.3	1.05
North Lewisburg	93	44	69.8	1.05
Portsmouth	86	50	68 8	6.75
Ruggles*	88	42	67.2	1.45
Tiffin *	92	44	67.7	1.61
West Milton	94	46	70.0	8.00
Wauseon	95	36	67.4	2.01
Westerville	88	40	66.4	2.11
Yellow Springs	84	43	66.9	4.54
Oregon.				
Albany*	91	54	63.5	0.36
Bandon*	70	47	55.1	0.31
East Portland *	92	50		0.04
Eola *	83	50	61.5	0.58
Gardiner *	84	46		
Klamath, Fort	85	23	58.6	1.11
La Grange	90	42		0.52
Mount Angel*	90	52	65.3	4.36
Pennsylvania.				
Bethlehem *	83	43	69.0	4.53
Blooming Grove *	86	48	61.9	3.20
Catawissa *	86	44	65.2	3.08
Drifton	86	32	62.0	2.60
Dyberry	86	38	62.4	1.21
Easton				3.93
Fallsington	82	56	66.0	2.90
Franklin*	86	36	59.5	4.33
Germantown*	81	54		
Pennsylvania—Con.				
Grampian Hills*	86	44	65.8	4.93
Mahanoy Plane	86	60	72.8	5.23
Philipsburg *	83	49	66.1	5.70
Quakertown	77	46	62.8	3.06
Troy*†	80	42	60.3	2.97
Wellsborough *	86	45	65.2	2.01
West Chester	86	50	66.4	4.30
Wilkesbarre	90	41	65.6	2.95
Wysox	84	50	67.1	3.60
Zionsville	86	50	70.3	4.58
South Carolina.				
Kirkwood *	85	67	70.4	7.07
Pacolet	83	64	73.4	9.20
Spartanburg	86	60	67.4	11.60
Stateburg*	90	62	75.0	5.35
Tennessee.				
Ashwood	89	58	73.5	5.20
Austin	92	60	74.8	7.37
Milan	90	56	72.8	4.84
Paris *	90	64	76.7	
Texas.				
Austin *	102	67	83.0	0.92
Cleburne	98	59	77.2	2.18
Comfort				1.88
Concho, Fort	112	60	84.6	1.60
Corsicana				3.94
Midland	103	60	80.6	1.42
McIntosh, Fort	104	63	86.1	4.64
Ringgold, Fort	110	57	87.7	2.08
New Ulm	102	66	81.7	0.68
Silver Falls	104	64	81.0	1.07
Vermont.				
Brattleborough	85	40	64.6	2.25
Burlington	82	45	67.0	1.98
Charlotte*	82	50	64.5	5.40
Lunenburg	78	40	59.9	1.70
Newport*	84	48	62.9	4.35
Post Mills*	84	42	63.0	1.50
Poultney	85	40	62.4	3.31
Strafford *	80	46	63.9	2.20
Virginia.				
Accotink	94	58	71.7	5.93
Bird's Nest*	97	62	74.4	6.40
Bruington				7.28
Dale Enterprise*	92	52	72.3	8.03
Marion	83	54	67.2	7.80
Monroe, Fort	89	59	72.2	7.20
Summit	90	46	69.4	
University of Va	80	62	70.7	7.33
Variety Mills	88	48	69.5	6.21
Wytheville	85	48	67.4	4.59
Washington Territory.				
Bainbridge Island *	90	46	62.3	0.41
Spokane, Fort	98	41	68.2	0.46
Tacoma *	83	47	60.7	1.03
Townsend, Fort	81	41	60.4	0.24
Walla Walla, Fort	93	43	70.7	0.56
West Virginia.				
Clarksburg	98	40	71.2	4.20
Helvetia*	86	42	65.1	5.46
Parkersburg	87	46	68.0	5.31
Wisconsin.				
Beloit	91	42	66.0	2.96
Embarras *	92	48	67.1	4.50
Fond du Lac *	93	31	66.0	1.56
Madison	94	44	67.6	1.08
Manitowoc	85	36	61.7	3.88
Neillsville *	91	25	57.4	2.55
Prairie du Chien	95	53	69.2	2.17
Wausau	90	33	63.4	2.55
Wyoming.				
Bridger, Fort	87	26	63.2	0.30
Fred Steele, Fort	93	33	65.3	0.04
Laramie, Fort	90	39	66.7	0.91
Washakie, Fort	90	38	64.4	2.46

† Observation taken at Mount Pisgah, near Troy.

NOTES AND EXTRACTS.

The following is an extract from the June, 1886, report of the "Alabama Weather Service," under direction of Prof. P. H. Mell, jr., of the Agricultural and Mechanical College, Auburn:

The month has been noted on account of the large per cent. of rain that fell and the few number of fair and clear days. The rains have been almost continuous for an average of eighteen days, and the crops are reported as being in very bad condition. Corn and cotton have been so badly choked with grass and weeds that much of the growth of the plants has been retarded and considerable damage is the result. Oats were injured very much in being harvested. The almost incessant rains and the many cloudy days prevented that amount of sunshine so necessary for the curing of oats, and much of this crop will be lost on the field. A small crop of corn will be made on the bottoms, and the melon and fruit crops have been seriously damaged by rotting and falling off, and in some sections the melon vines have been injured by mould

and other forms of fungi. The precipitation was 3.84 inches above the normal.

State summary.

Temperature.—Mean temperature, 75°.8; highest temperature, 97°, at Union Springs, on the 11th; lowest temperature, 52°, at Gadsden, on the 19th; range of temperature, 45°; greatest monthly range of temperature, 42°, at Gadsden; least monthly range of temperature, 19°, at Owischee; mean daily range, 13°; greatest daily range of temperature, 32°, at Gadsden, on the 26th; least daily range of temperature, 0°, at Valley Head, on the 27th.

Precipitation.—Mean depth of rainfall, 8.74 inches; mean daily rainfall, 0.291; greatest depth of monthly rainfall, 12.41 inches, at Lineville; least depth of monthly rainfall, 5.49 inches, at Mobile; greatest daily rainfall average for state, 0.97 inch, on the 23d; greatest daily local rainfall, 4.42 inches, at Evergreen, on the 9th.

Average number of days on which rain fell, 17; average number of cloudy days, 16; average number of fair days, 9; average number of clear days, 5.

Warmest days, 2d, 3d, and 12th; coldest days, 4th, 19th, 21st, and 22d.

Prevailing direction of wind, southeast.

Chattanooga reports that the greatest velocity of wind was twenty-two miles per hour from the north; Mobile, twenty-two miles from the southeast, and Montgomery, thirty-two miles from the west.

The following is an extract from the June, 1886, "Bulletin of the Colorado Meteorological Association," under direction of Prof. F. H. Loud, of Colorado College, Colorado Springs:

The weather of June, 1886.

The weather of the month may be described under three periods: the first extending from June 1st to 9th; the second including the week from June 10th to 16th, inclusive; and the third comprising the remainder of the month. During the first period there was first a barometric rise, lasting from two to four days at different stations, then a decline of no great magnitude, and finally a rise to a second maximum, which terminated the period. The weather was, in general, cool, and showers were frequent. The first and second days were dates of the most important rainfall of the month, which appears to have been confined to the eastern slope of the continental divide. During the second period the barometer descended to the monthly minimum on the 12th, and rose during the four days following. There was no rainfall reported from the western slope, and only local and moderate showers on the eastern side. The 13th and adjacent days were remarkably clear. The temperature of the week was high, declining near the close. The weather of the third period was quite local in character. The oscillations of the barometer were slight, the lowest daily mean, on the 24th, being generally higher by more than two-tenths of an inch than that of the 12th. The precipitation was all, or almost all, in the form of thunder showers of small area, some of these, in the northern and northeastern parts of the state, were accompanied by violent hail, doing damage to crops which has been estimated to reach a quarter of a million dollars. The temperature was moderate at the beginning of the period, but exhibited a decided increase toward the end of the month.

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The association solicits the aid of all persons in Colorado who are interested in the subject of meteorology. Those who are willing to take observations are requested to address the director, who will also welcome any suggestions looking to increased efficiency of the weather service. On the subject of membership the secretary of the association, Dr. S. A. Fisk, may be addressed at 373 Curtis street, Denver.

The following meteorological summary and notes, for June, 1886, are from the Georgia "Crop Report," prepared under direction of Hon. J. T. Henderson, Commissioner of Agriculture for Georgia:

Districts.	Temperature.			Rainfall.	
	Maximum.	Minimum.	Mean.	Average amount.	Average No days.
	°	°	°	*Inches.*	
Northern Georgia	89.0	60.0	73.2	7.85	14
Middle Georgia	91.0	63.0	75.5	9.64	14
Southwestern Georgia	92.0	69.0	79.9	12.13	13
Eastern Georgia	90.0	64.0	76.5	10.17	12
Southeastern Georgia	94.0	71.0	80.8	6.82	10
Means for state	91.2	65.4	77.2	9.32	13

Temperature and rainfall.

The mean temperature of the spring, and thus far of the summer months, has been much lower than what is usual for the time of year, and the amount of rain for the same time very much greater. The average amount of rainfall for the month of June in the state is 9.32 inches, being 5.32 inches in excess of the average for June, as determined from past observations. There was an average of fourteen rainy days in north and middle Georgia, and at some places as many as twenty. In southern Georgia the precipitation was somewhat heavier, but the rainy weather was not altogether so continuous. At Americus there was the large total rainfall during the month of 16 inches.

The following meteorological summary and accompanying remarks are from the June, 1886, report of the "Indiana Weather Service," under direction of Prof. H. A. Huston, of Purdue University, Lafayette:

Districts.	Temperature.			Average precipitation.
	Highest.	Lowest.	Monthly means.	
	°	°	°	*Inches.*
Northern counties	93.0	42.0	68.1	3.55
Central counties	93.0	37.0	68.2	5.46
Southern counties	94.0	48.0	70.9	7.21
State	94.0	37.0	69.1	5.41

Temperature.—The mean temperature of the state for June, 1886, was 1°.2 below the mean of June for the past four years; 3°.0 below the mean of sixteen years at Indianapolis; 4°.8 below the mean of thirty-one years at Logansport; 5°.0 below the mean of twenty-one years at Vevay; 1°.4 below the mean of thirty-two years at Spiceland; 3°.0 above the mean of seven years at Mauzy; 2°.7 below the mean of nine years at Blue Lick; 3°.5 below the mean of four years at Worthington; 0°.5 below the mean of four years at Connersville; 0°.7 below the mean of seven years at Lafayette; and about 3°.4 below the normal temperature for June. The mean temperature at the various stations was below the normal, the amounts ranging from 0°.9 to 3°.5.

Rainfall (inches).—The mean rainfall for the state was 0.85 above the mean of June for the past four years; 0.22 below the mean of fifteen years at Indianapolis; 1.48 above the mean of thirty-one years at Logansport; 0.53 above the mean of twenty-one years at Vevay; 0.67 above the mean of twenty-eight years at Spiceland; 0.01 below the mean of six years at Mauzy; 0.79 above the mean of four years at Blue Lick; 0.29 above the mean of four years at Worthington; 0.43 above the mean of four years at Connersville; and 0.25 below the mean of seven years at Lafayette. The rainfall has been unequally distributed throughout the state; at most stations it has been in excess of the normal, while at Indianapolis it was 0.71 below the normal, and at Lafayette 3.06 below. A severe hail storm did considerable damage near Connersville on the 25th.

The following summary for June, 1886, is from the report of the "Minnesota Weather Service," under direction of Prof. Wm. W. Payne, Carleton College, Northfield:

Temperature.—The average temperature of Minnesota for June, 1886, as deduced from reports received from the stations of the Minnesota Weather Service, is 65°.4; this is 6°.5 warmer than the preceding month of May, and 1°.3 warmer than the mean for June, 1885. The maximum heat was quite generally above 90°.0, the highest reading being 97°.0, at Spring Valley, on the 15th; and the lowest maximum, 86°.0, on the 11th and 14th, at Dodge Center. But one station reported the minimum temperature for the month as below 30°, 28°.0 being recorded at Grand Forks on the morning of the 5th, on which date frosts more or less injurious were general in the northwestern part of the state. The first decade of the month was dominated by cool and pleasant weather. From the 10th until the 15th a very warm wave prevailed in all sections except in the immediate vicinity of Lake Superior. The last half of the month was marked by moderately warm weather and a very even temperature, becoming gradually warmer as the end of the month approached.

Precipitation.—The precipitation has in general been less than the usual amount with a very decided deficiency in the southwestern part of the state, where continued drouth has been disastrous to the growing crops—so much so that estimates foreshadow but one-half of an average yield. The largest quantity recorded was 5.35 inches, at Duluth; the least, 1.89 inches, at La Crosse. During the first ten days of the month but little rain fell; the second decade was wet and the third dry, with only light local showers.

The following is an extract from the June, 1886, report of the "Missouri Weather Service," under direction of Prof. Francis E. Nipher, Washington University, Saint Louis:

Temperature.—June, 1886, has had an average temperature of 73°.8 at the central station, which is 0°.9 below the normal for Saint Louis. The lowest temperature observed during the month was 57°.5, on the 5th, and highest, 88°, on the 15th and 16th. The mean temperature for each decade was 71°.7 for the first, 76°.3 for the second, and 73°.3 for the third. The highest temperatures reported from the state were 101° at Pro Tem, Taney county, 96° at Greenfield, Miami, and Sedalia, and 95° at Louisiana and Mound City. Lowest temperatures observed were 42°, at Ironton; 44°, at Miami; and 45°, at Steelville and Mound City. Chamois reports the mean temperature of the past month as being 3°.2 below the normal of that place for the last thirteen years, and also an excess of rainfall of 3.89 inches.

Precipitation.—The rainfall was 7.26 inches, which is 1.78 above the normal for the central station. In the state the greatest rainfall was 8.41 inches at Sedalia, 7.66 inches at Chamois, 7.39 inches at Miami, and 6.75 inches at Laffin. Towards the north the fall was less than two inches, being 1.73 at Kirksville and 1.51 at Mound City.

The following is an extract from the June, 1886, "Bulletin of

the New England Meteorological Society," under direction of Prof. Winslow Upton, Providence, Rhode Island:

Reports for the month were received from one hundred and forty-nine observers.

General conditions.—The month was an unusual month, because characterized by a deficiency in nearly all the usual conditions. The temperature was low, the rainfall meagre (except at a few stations), the pressure nearly normal, and there was an absence of severe local storms or high winds. The meteorological history of the month may be briefly given: on the 2d a cyclonic depression moved down the Saint Lawrence Valley, with general rains; this storm was noteworthy from the fact that the greater part of the rain fell after the centre had passed; cool, fair weather prevailed until the 12th, interrupted by light rains attending the easterly passage of two minor depressions north of the district, on the 7th and 9th, respectively. Partly cloudy skies, with occasional showers, prevailed from the 13th to the 18th, the pressure lingering below the normal west of New England, and finally developing into a cyclone which moved in the usual path north of the district on the 17th. Fair, cool weather prevailed until the 22d, when a second period of damp, cloudy weather, with frequent showers, remained until the 26th, resulting from the following barometric conditions: a cyclone moved from the Gulf northeasterly on the 22d, but lost its indenty on 23d in the Middle States, a large ill-defined area, with pressure a little below the normal, remaining in the central states for several days. A cyclone eventually formed in the Lake region, moving northeasterly, on the 25th. Fair, cool weather prevailed from the 27th to the 30th. It will be noted that all of the five depressions, whose attendant conditions modified the weather in New England, moved north of the district along the Saint Lawrence Valley, while the only depression which approached from the Gulf was dissipated before reaching New England.

Local storms.—The rains of the month, except that of the 3d instant, were chiefly in form of frequent showers, and the distribution of the rainfall was quite irregular. There was no general thunder-storm reported.

The condition of vegetation has been good, but the lack of rain threatens drought. The hay crop is especially excellent. Light frosts occurred on several dates, and a little damage was reported from New Hampshire on the 19th.

The following is an extract from the "Tennessee State Board of Health Bulletin," for June, 1886, prepared under the direction of J. D. Plunkett, M. D., President of the State Board of Health. The weather report is prepared by Major H. C. Bate, in charge of the State Meteorological Service:

The principal meteorological feature of June was the great and almost unprecedented amount of precipitation.

The mean temperature was 71°.54, about two and a half degrees below that for June of last year, and slightly below the means for June of the two previous years. The highest temperature was 93°, recorded on the 1st, and was 5° below the maximum recorded in June of last year, which was respectively 1° and 3° above the maximum points reached in June, 1883 and 1884. The lowest temperature was 48°, recorded on the 19th, and was 4° below the minimum of June, 1885, and 1° above that of the corresponding period of the two years previous. The monthly range of temperature was 45°, respectively 5°, 3°, and 1° less than the monthly ranges of June of the three preceding years, beginning with 1883.

The mean precipitation for the month was 7.24 inches, being at least three inches in excess of the normal mean for the month. Of this amount the eastern division received an average of about seven and one-third inches, the middle division received a little over seven inches, and the western division received nearly seven and a half inches. The greatest monthly rainfall was 12.20 inches, reported at Greeneville. Nearly half of this amount fell on one day, the 28th, when 5.10 inches was recorded. This was the greatest local daily rainfall during the month, and it is worthy of note that the greatest local daily fall during May occurred at the the same station and on the corresponding day of the month.

There were other very heavy local rainfalls during the month, notably at Savannah on the 2d, 2.41 inches; Nashville, 3d, 2.03 inches; Memphis, 13th, 2.79 inches; Hohenwald, 14th, 2.36 inches, also on the 20th, 2.30 inches; Bolivar, 16th, 3.72 inches (which amount the observer says fell in thirty-five minutes); Covington, 16th, 2.63 inches; Waynesborough, 17th, 2.20 inches, also on the 20th, 4.75 inches; Fostoria, 21st, 2.00 inches; Riddleton, 27th, 2.51 inches, and at Greeneville, 29th, 2.60 inches. Several other heavy local rains were reported, ranging from an inch and a half to nearly two inches. In addition to the greatest monthly fall at Greeneville, there were heavy monthly falls at Waynesborough, 11.53 inches; at Hohenwald, 10.34 inches; at Savannah, 11.14 inches, and at Riddleton, 9.52 inches. Many of the rains were general and some were the heaviest known in the localities where they occurred. But few of these rains were attended with very violent electrical disturbances and none with very high winds. The month, taken altogether, was literally a month of rains, as only one day, the 11th, was reported without some precipitation in some portion of the state. The percentage of cloudiness was largely in excess of the normal, considering this, the number of dews reported was unusually large, twenty-three being reported in various portions of the state, and on all days except the 3d, 7th, 14th, 16th, 17th, 21st, and 22d.

State summary.

Mean temperature, 71°5; highest temperature, 93°, on the 1st, at Memphis; lowest temperature, 48°, on the 19th, at Farmingdale; range of temperature, 45°; mean monthly range of temperature, 31°.86; greatest monthly range of temperature, 42°, at Farmingdale; least monthly range of temperature, 23°, at Covington; mean daily range of temperature, 13°.5; greatest daily range of temperature, 35°, on the 7th, at Sailor's Rest; least daily range of temperature, 2°, on the 3d, at Trenton, on the 8th, at Careyville and Ashwood, on the 14th, at Florence Station, on the 16th, at Hurricane Switch, and on the 20th, at Parksville; mean of maximum temperatures, 89°.36; mean of minimum temperatures, 57°.5.

Mean depth of rainfall, 7.24 inches; mean daily rainfall, 0.241 inch; greatest rainfall, 12.20 inches, at Greeneville; least rainfall, 4.14 inches, at Trenton; greatest local daily rainfall, 5.10 inches, on the 28th, at Greeneville; days of greatest rainfall, 2d, 7th, 8th, 13th, 14th, 15th, 16th, 17th, 20th; day of greatest, 17th.

Average number of days on which rain fell, 15.8; average number of clear days, 5.9; average number of fair days, 9.8; average number of cloudy days, 14.3.

Days without rainfall, 11th, 18th.

Warmest days, 1st, 12th; coldest days, 5th, 19th.

Prevailing winds, south and southwest.

The following is from the June, 1886, report of the "Nebraska Weather Service," under direction of Prof. Goodwin D. Swezey, of Doane College, Crete:

The month of June was, in most respects, a month of normal conditions, and one generally favorable to the growth of crops. The temperature was almost exactly the average of the past eight Junes, though less than usual of extremely hot days. The rainfall was slightly deficient, but more evenly distributed through the month than usual. There were few severe storms.

Observer S. S. Kauffman, of Stromsburg, reports the heaviest rain ever known on the 14th, with a strong wind and some hail, but no great damage done; but at Osceola both rain and hail did considerable damage.

D. P. Nicholson reports one of the heaviest rains of the season at York on the 6th.

Comparison of past Junes.

The table shows the mean temperature, the noon temperature, and the number of days above 85° for the past nine Junes in southeastern Nebraska; they are found by averaging the numbers reported at the different stations. It also shows the highest temperatures and the lowest recorded anywhere in the state by standard self-registering thermometers:

June.	Mean temperature.	Noon temperature.	Above 85°.	Highest temperature.	Lowest temperature.
	°	°		°	°
1878	66.7	77.8	8.5	—	—
1879	69.9	81.0	11.4	92	49
1880	73.4	81.1	11.6	97	46
1881	74.1	82.8	12.4	95	58
1882	72.2	79.5	11.4	93.1	45.7
1883	69.4	77.8	3.6	96	42
1884	71.9	81.7	14.2	94	44.8
1885	65.8	78.8	9.0	93.8	42.8
1886	70.0	80.3	8.7	80.1	33

The average rain for the different sections of the state for June, 1886, is as follows: northeast section (one station), 2.30 inches; north-middle (no station), ——; west (one station), 2.66; south-middle (two stations), 2.31; southeast (covering essentially what has heretofore been the "whole state" as far as reporting), 4.22 inches; state average by sections, 2.87.

The following table shows the precipitation, or depth in inches of rain and melted snow or hail, the number of days on which it fell, and the number of cloudy and of clear days. Days are counted cloudy when the sky is four-fifths overcast; clear when less than one-third. The last column shows the number of thunder-storms:

June.	Precipitation.	Days of precipitation.	Cloudy days.	Clear days.	Thunder.
	Inches.				
1878	5.98	8.2	4	12.7	4.6
1879	4.94	8.2	3.1	14.1	5.6
1880	5.27	7.1	3.6	12.9	6.5
1881	5.18	8.1	1.6	12.3	8.8
1882	5.24	10.5	5.8	8.6	10.3
1883	9.44	11.2	3.7	13	9
1884	2.48	5.9	2.7	11.3	6.7
1885	2.77	8	4.2	13.4	5.8
1886	4.22	8.9	1.9	15	5.2

The following is from the June, 1886, report of the "Ohio Meteorological Bureau," under direction of Prof. B. F. Thomas, of the Ohio State University, Columbus:

The meteorological record of Ohio for June, 1886, is marked by low barometric pressure, low temperature, and low daily average of temperature, with westerly winds and small rainfall. The mean temperature was 67°.5, the lowest mean for four years, 1°.2 below the average for that period, and 2°.9 below the normal. The highest temperature recorded was 97°.5, on the 14th;

lowest, 34°.0, on the 4th. The mean daily range of temperature was 20°.8, the average for four years being 22°.1.

The average rainfall was 3.53 inches, 0.24 inch less than the four year average, and 0.49 inch less than the normal. The greatest rainfall was recorded at Hanging Rock, 8,44 inches, and the least at Cleveland, 1.01 inches. General rains fell on the 2d and 9th, 13th to 17th, and 20th to 25th.

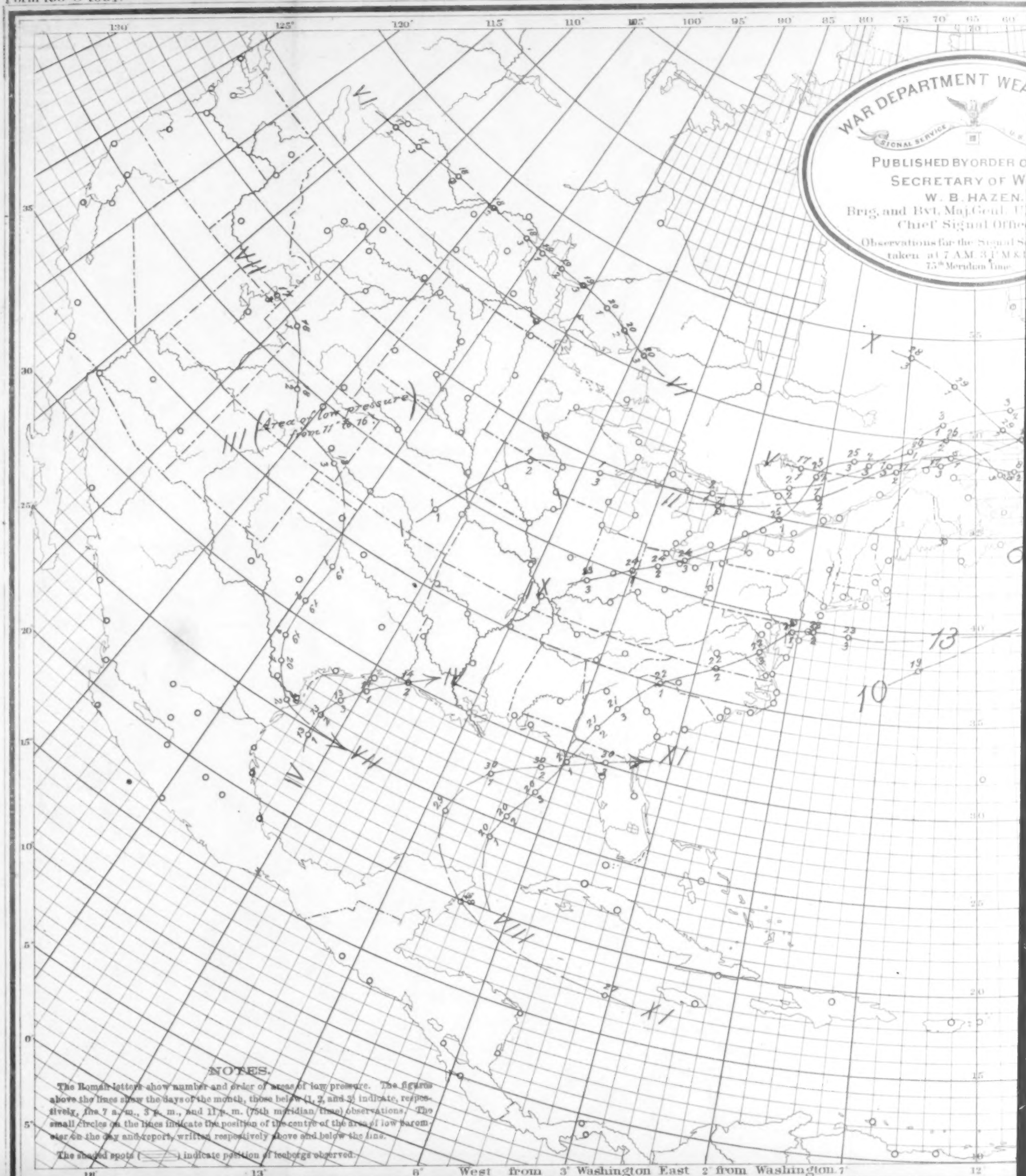
Summary.

Mean temperature, 67°.5; highest temperature, 97°.5, on the 14th, at Ohio State University; lowest temperature, 34°.0, on the 4th, at Paulding; range of temperature, 52°.5; mean daily range of temperature, 20°.8; greatest daily range of temperature, 44°.6, on the 12th, at Wauseon; least daily range of temperature, 4°.6, on the 27th, at Cincinnati; number of clear days, 10.5; fair days, 11; cloudy days, 8.5; days on which rain fell, 10.9; greatest number of days on which rain fell, 16, at Pomeroy; least number of days on which rain fell, 6, at Troy; mean rainfall, 3.53 inches; average daily rainfall, 0.12 inch.

Prevailing direction of wind, west.

Form 106 C 1884.

Chart I. Tracks of Areas of Low

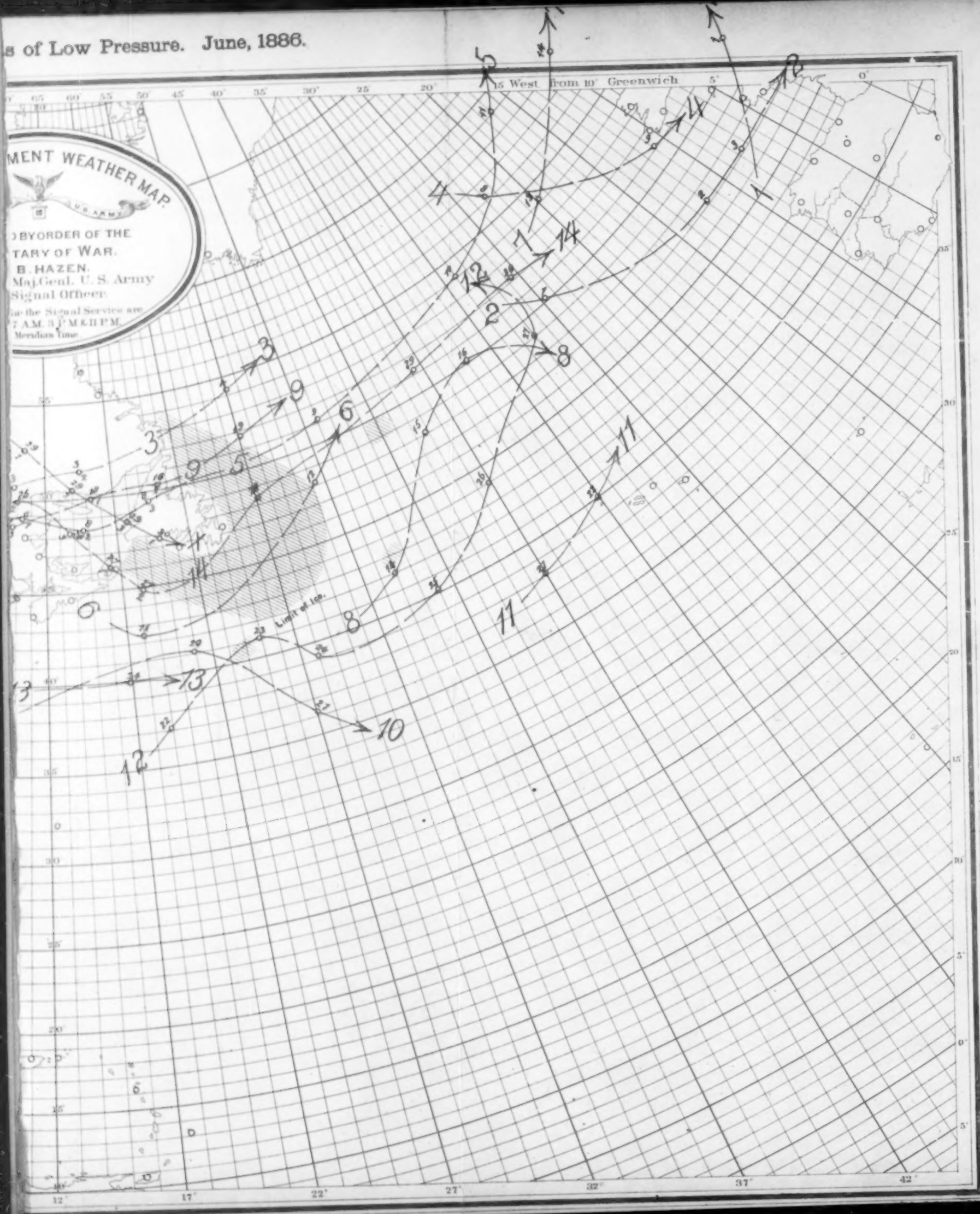

WAR DEPARTMENT WEA
SIGNAL SERVICE
PUBLISHED BY ORDER O
SECRETARY OF W
W. B. HAZEN,
Brig. and Bvt. Maj. Genl. U
Chief Signal Offic
Observations for the Signal S
taken at 7 A.M. 3 P.M. &
75th Meridian Time
(Area of low pressure from 11 to 16.)
130° 125° 120° 115° 110° 105° 100° 95° 90° 85° 80° 75° 70° 65° 60°
35 30 25 20 15 10 5 0 5°
18 13 8° West from 3° Washington East 2° from Washington 7 12

NOTES.

The Roman letters show number and order of areas of low pressure. The figures above the lines show the days of the month, those below (1, 2, and 3) indicate, respectively, the 7 a. m., 3 p. m., and 11 p. m. (75th meridian time) observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.

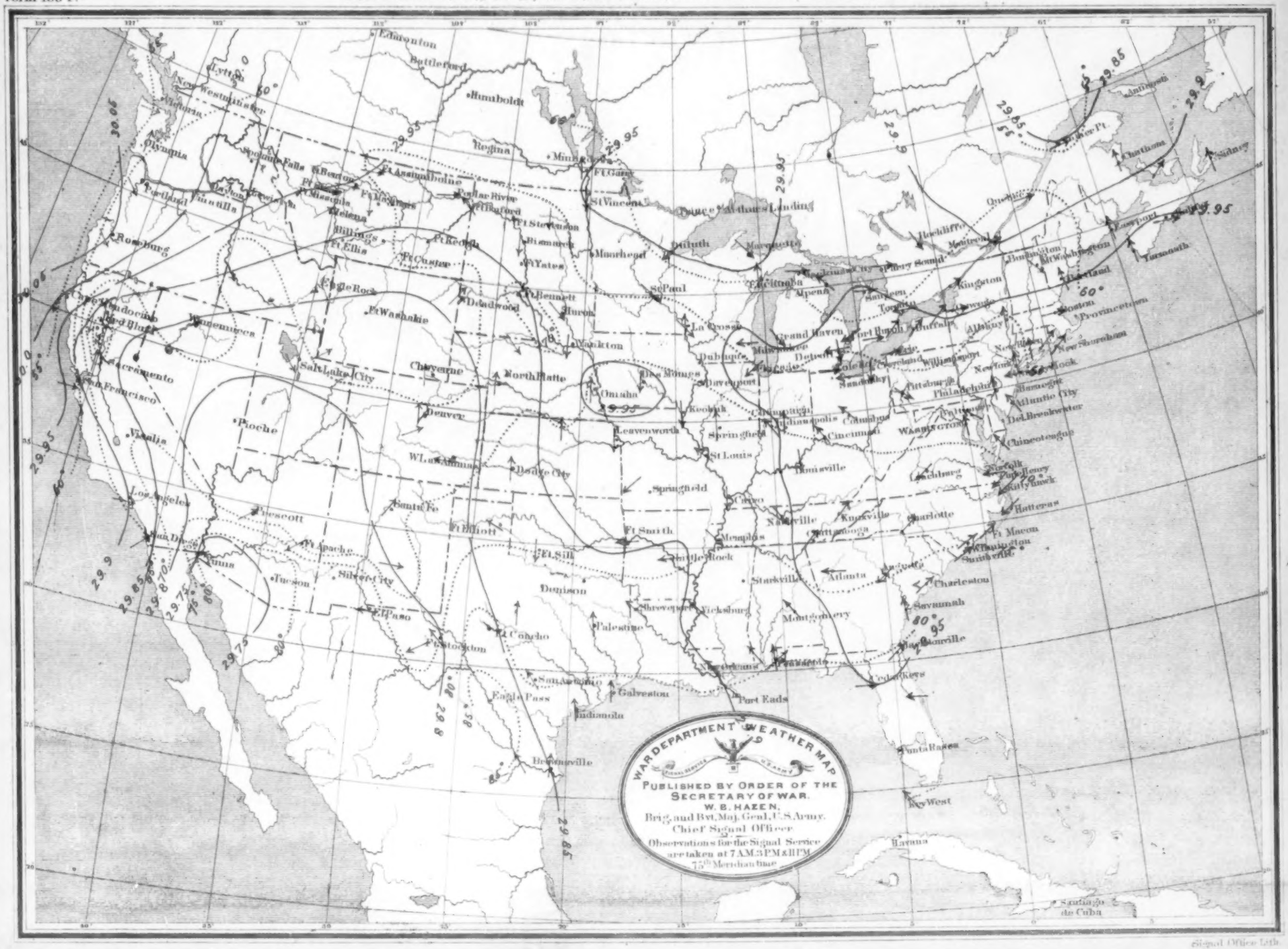
The shaded spots ( ) indicate position of icebergs observed.

s of Low Pressure. June, 1886.



Form 106 F.

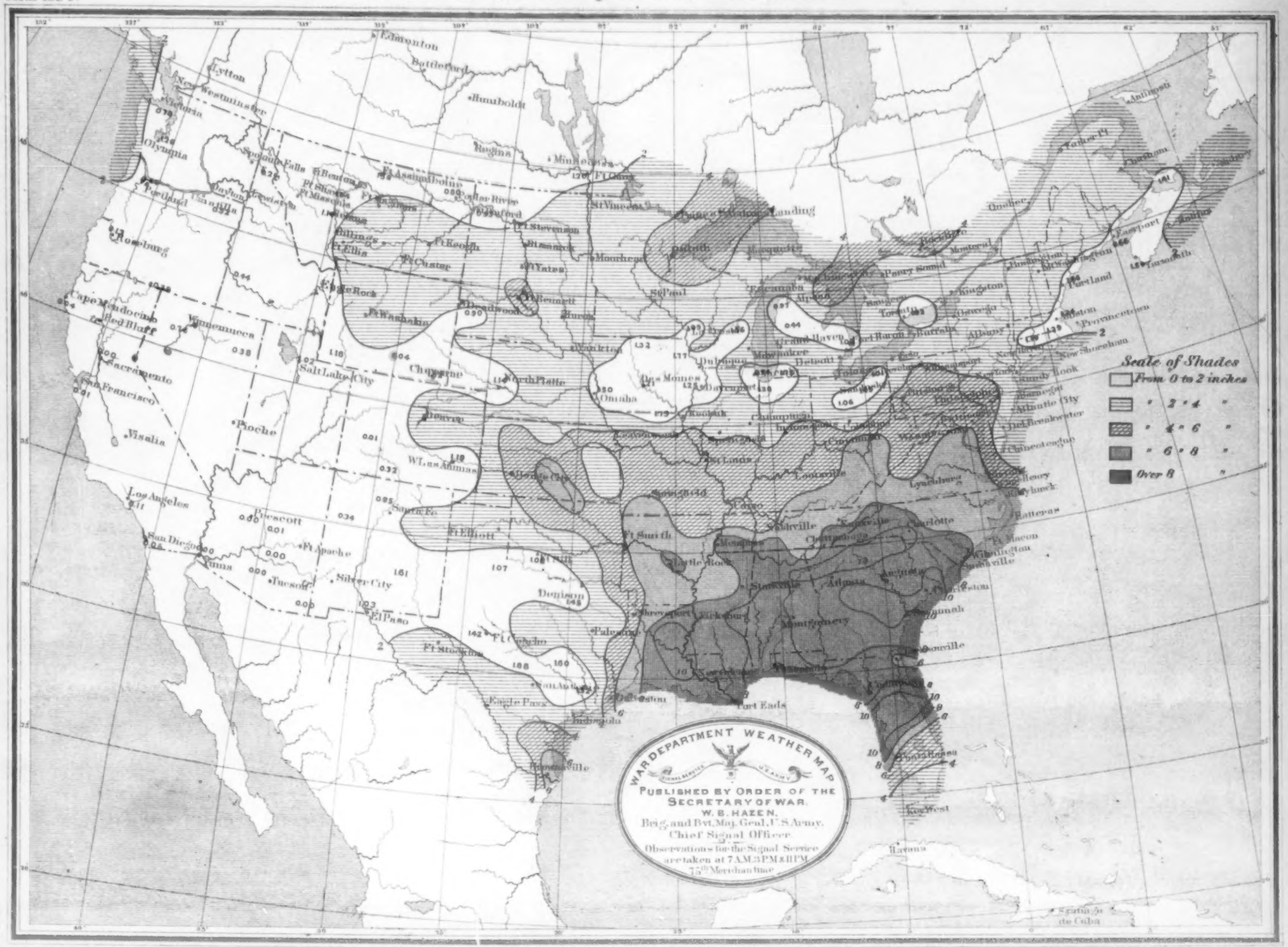
Chart II. Isobars, Isotherms, and Winds. June, 1886.



Signal Office Lith.

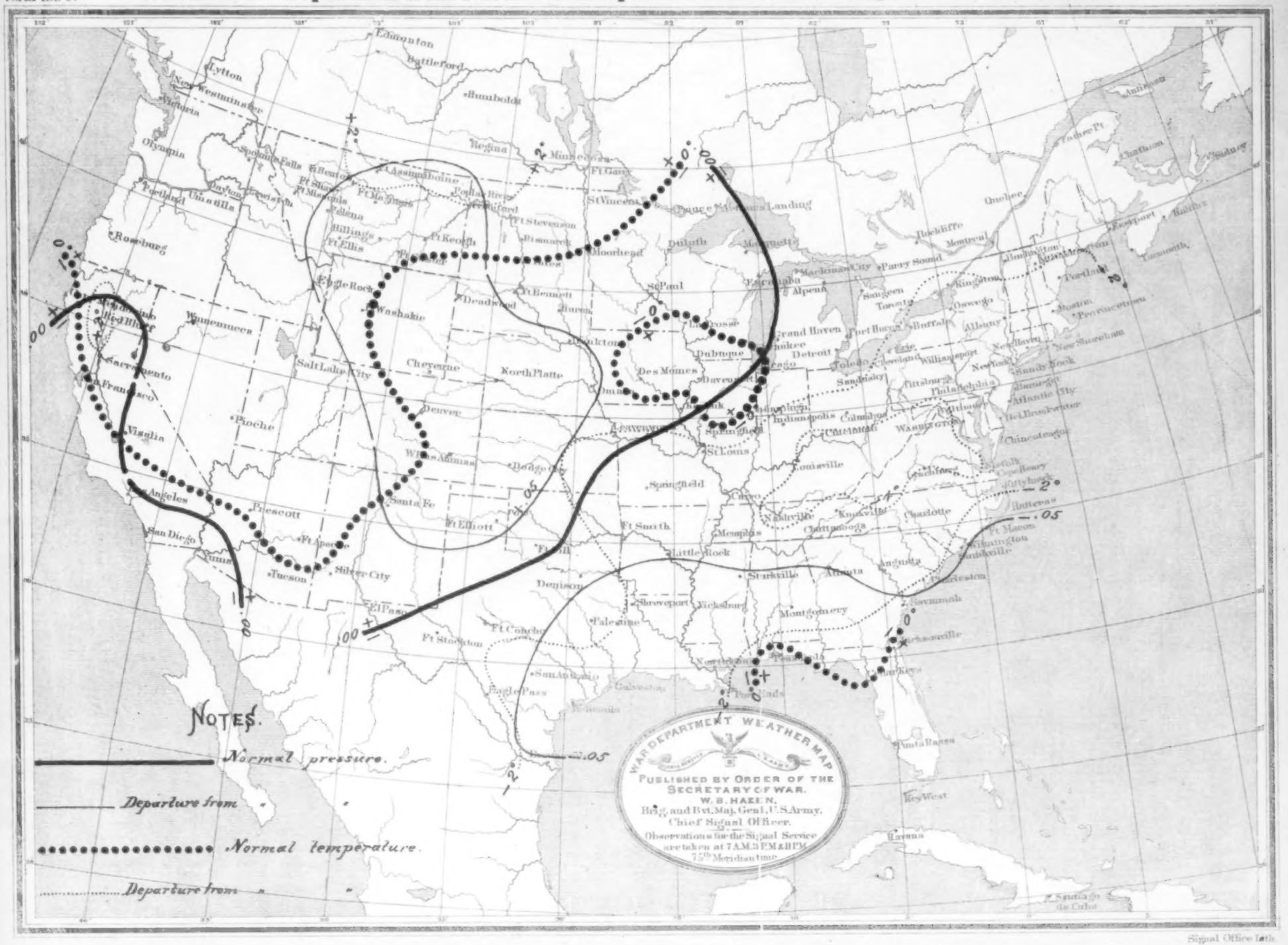
Form 106 F.

Chart III. Precipitation, June, 1886.


Scale of Shades
From 0 to 2 inches
" 2 " 4 "
" 4 " 6 "
" 6 " 8 "
Over 8 "
WAR DEPARTMENT WEATHER MAP
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
W. B. HAZEN,
Brig. and Bvt. Maj. Genl. U. S. Army,
Chief Signal Officer.
Observations for the Signal Service are taken at 7 A.M. 3 P.M. & 11 P.M. 75th Meridian time.
Signal Office Lith.

Form 106 F.

Chart IV. Departures from Normal Atmospheric Pressure and Temperature. June, 1886.


NOTES.
Normal pressure.
Departure from " "
Normal temperature.
Departure from " "
WAR DEPARTMENT WEATHER MAP
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
W. B. HAZEN,
Brig. and Bvt. Maj. Gen'l, U.S. Army,
Chief Signal Officer.
Observations for the Signal Service are taken at 7 A.M. 3 P.M. & 11 P.M.
75th Meridian time.

Signal Office Lith.

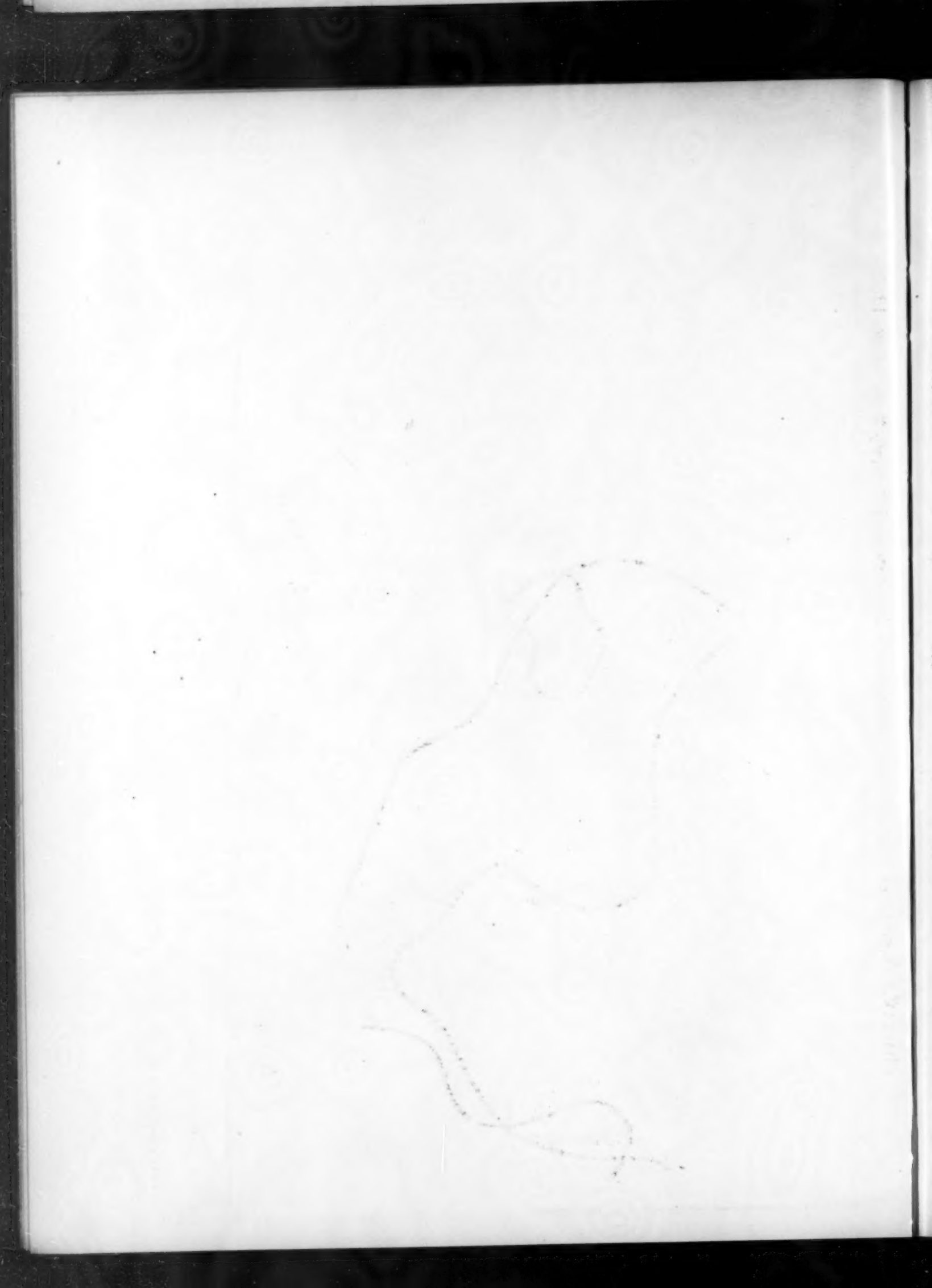
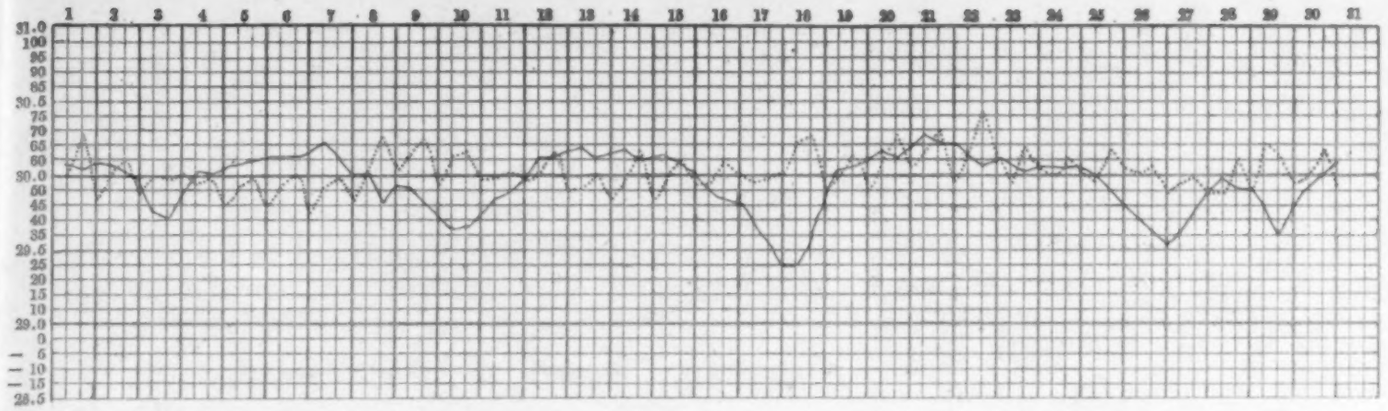
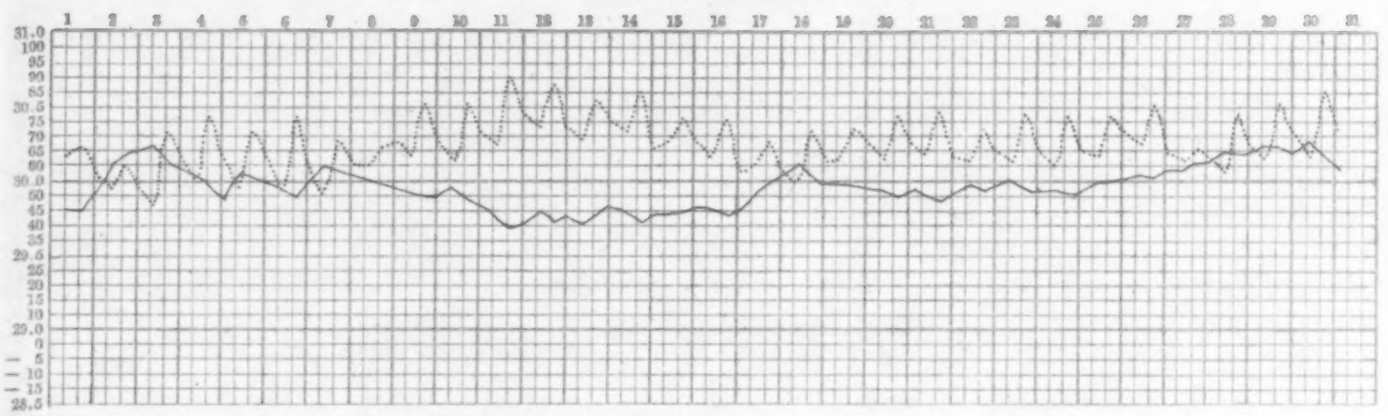


Chart V. Pressure (————) and Temperature (·····) Curves. June, 1886.

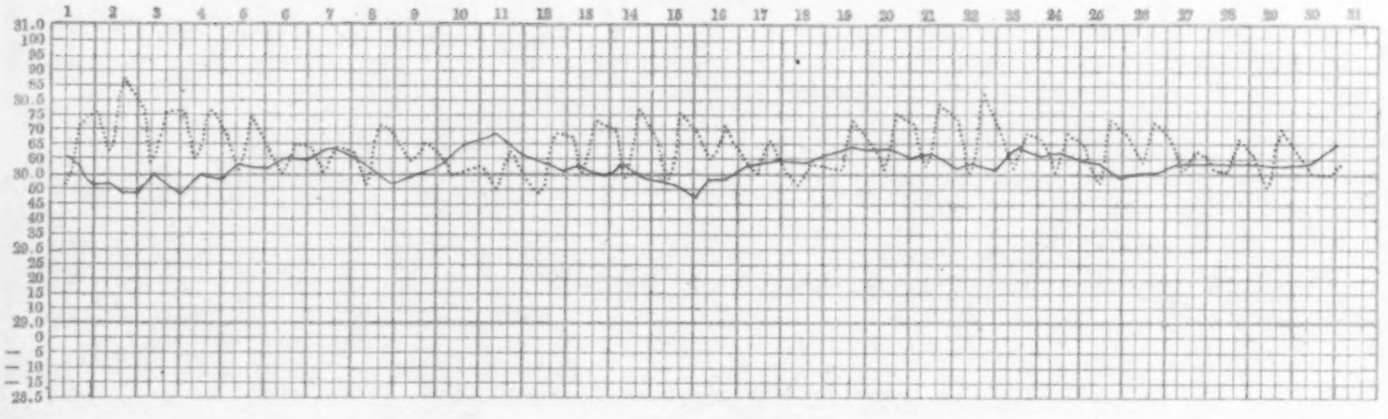
EASTPORT, ME.



SAINT PAUL, MINN.



PORTLAND, OREG.



NEW ORLEANS, LA.

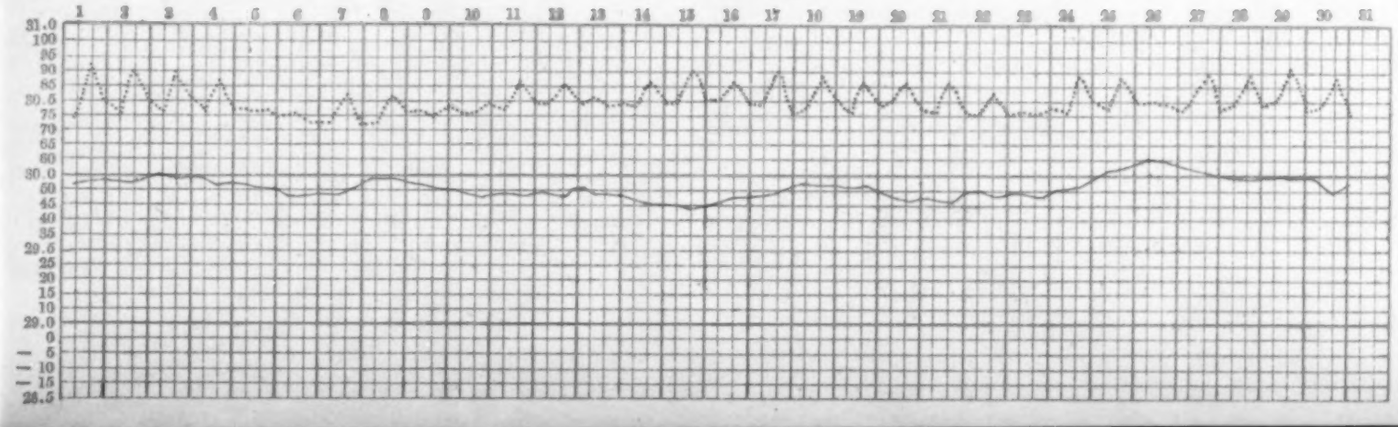
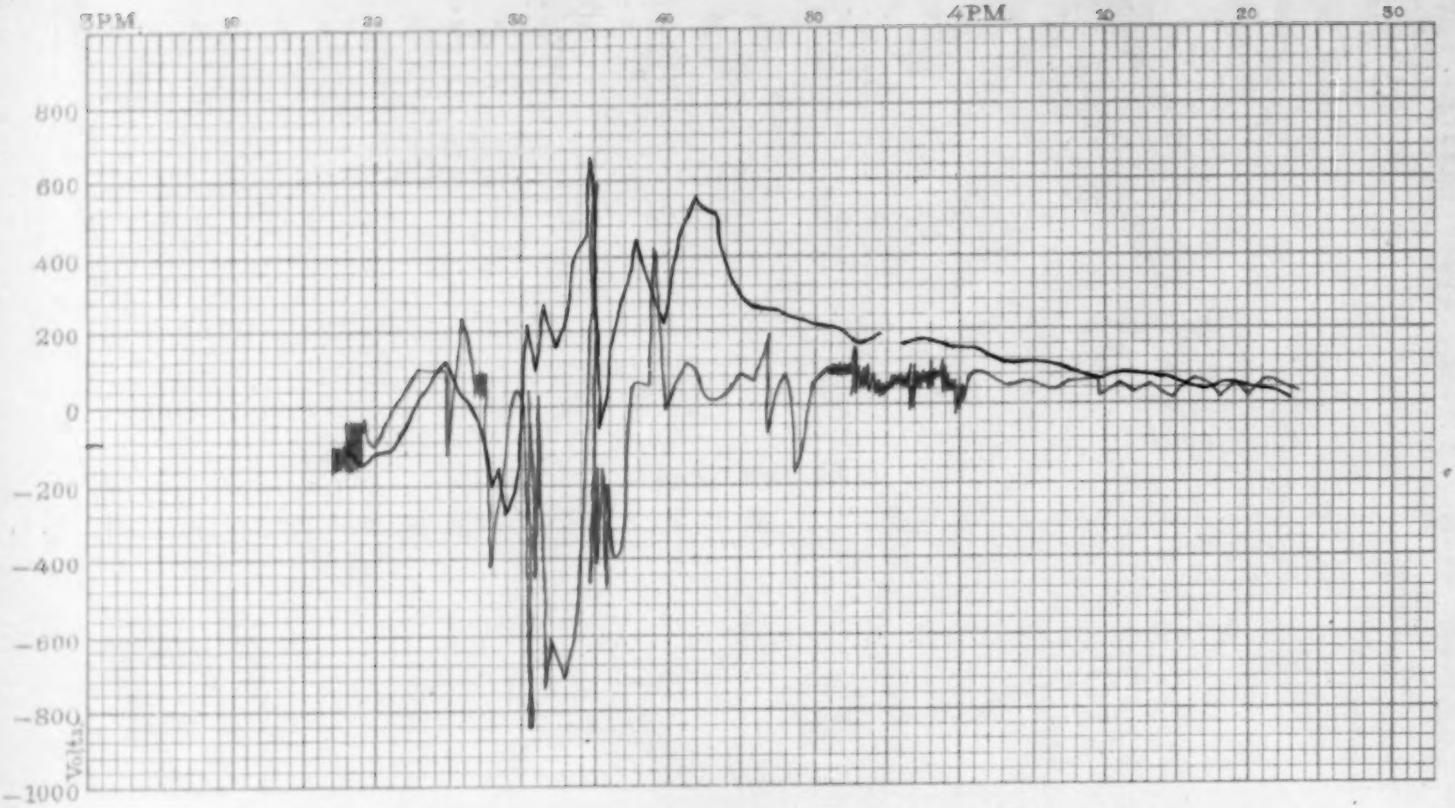
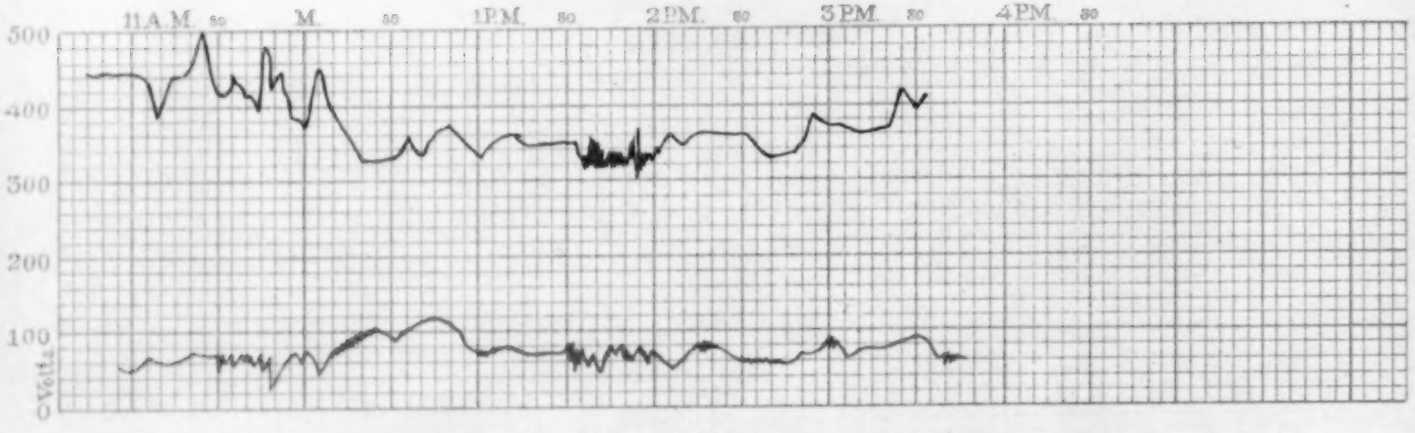


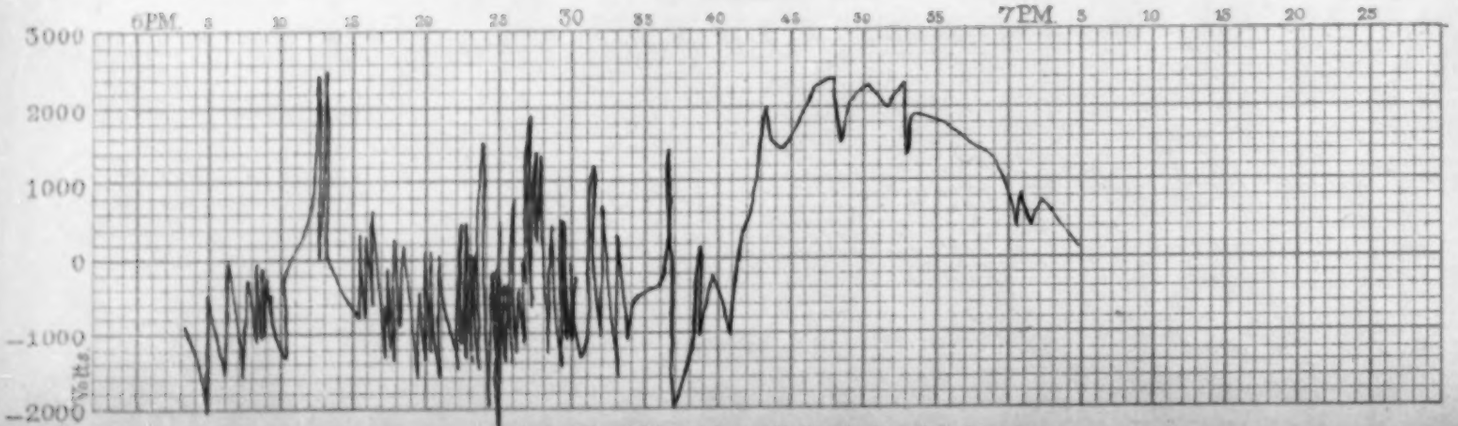
Chart VI. Curves showing Electrometer Readings.



June 17, 1886. Smithsonian Institution ——— } during thunder-storm.
Signal Office ——— }



July 20, 1886. Top of Washington Monument ——— }
Signal Office ——— }



June 25, 1886. Ithaca, N. Y., during thunder-storm.

Voluntary observers of the Signal Service, on land, from whom meteorological reports were received in time to be used in the preparation of the Monthly Weather Review for June, 1886.

Observer and place of observation.
Andrews, Lauman, Southington, Conn.
Adams, Effie, Logan, Iowa.
Alexander, S., Birmingham, Mich.
Anderson, Dr. W. W., Stateburg, S. C.
Altaffer, J. M., Independence, Kans.
Adams, Dr. O. H., Vineland, N. J.
Abbott, Dr. E. K., Salinas, Cal.
Arents, Hiram, Oroville, Cal.
Avey, O. H., Oskaloosa, Iowa.
Adams, A. H., Fort Meade, Fla.
Anderson, Prof. J. T., Fayette, Mo.
Bass, G. S., Quincy, Mass.
Bushnell, W. S., Monticello, Ind.
Bentley, David, Princeton, Cal.
Bryant, A. T., Yutan, Nebr.
Bisbee, Capt. Lewis, Buckfield, Me.
Boerner, Prof. Chas. G., Vevay, Ind.
Boynton, John F., Syracuse, N. Y.
Bayerly, J. F., Spartanburg, S. C.
Ballou, Dr. N. E., Sandwick, Ill.
Bennett, Geo., Bandon, Oreg.
Bell, Joseph, Franklin, Pa.
Brainerd, Dr. H. G., Independence, Iowa.
Baker, Dr. Henry B., Lansing, Mich.
Beall, Dr. R. L., Lenoir, N. C.
Brendel, Dr. Fred., Peoria, Ill.
Bartlett, E. B., Vermillion, N. Y.
Baldwin, A. L., Bethel, Conn.
Briggs, John, Albany, Oreg.
Betts, Prof. Arthur, Webster, Dak.
Breed, J. E., Embarras, Wis.
Boyd, Joseph, Oskaloosa, Iowa.
Boles, Lieut. A. H., Hudson, Mich.
Beans, T. J., Moorestown, N. J.
Beloit College Observatory, Beloit, Wis.
Black, W. H., Kalamazoo, Mich.
Blachly, C. P., Manhattan, Kans.
Bridges, Q. A., Berlin Mills, N. H.
Beecher, Chas., Wysox, Pa.
Bowman, Peter, Ruggles, Ohio.
Cook, S. A., Milledgeville, Ga.
Carrington, O. D., Brownville, Nebr.
Clark, T. A., Wausau, Wis.
Charbonnier, Prof. L. H., Athens, Ga.
Casey, Geo., Auburn, N. Y.
Crawford, E. A., Liberty Hill, [illegible]
Curtiss, G. G., Fallston, Md.
Cornell University, Ithaca, N. Y.
Cutting, Dr. Hiram A., Lunenburg, Vt.
Crosier, Adam, Laconia, Ind.
Caulkins, John S., Thornville, Mich.
Cass, John J., Allison, Kans.
Cleveland, Dr. G. H., Pentwater, Mich.
Collie, G. L., Delevan, Wis.
Cotton, Dr. D. B., Portsmouth, Ohio.
Cheney, Wm., Minneapolis, Minn.
Culver, G. E., Vermillion, Dak.
Carter, Rev. Dr. W. H., Tallahassee, Fla.
Collin, Prof. A., Mount Vernon, Iowa.
Cummings, L. D., Palmyra, N. Y.
Chubbs, Thos. H., Post Mills, Vt.
Cole, Seward, Cahuenga, Cal.
Cutler, B. B., Heath, Mass.
Childs, W. H., Brattleborough, Vt.
Clark, T. A., Weldon, N. C.
Cochran, Wm. P., Wakefield, Kans.
Colton, Prof. G. H., Hiram, Ohio.
Caffee, Wm. K., Carthage, Mo.
Chandler, Dr. W. J., South Orange, N. J.
Cass, W. Earle, Roseland, N. J.
Calhoun, P. B., Austin, Tenn.
Chapin, Adams, Poway, Cal.
Dudley, C. B., Altoona, Pa.
Dazey, J. B., Charleston, Ill.
Dow, Roswell, Sycamore, Ill.
Deming, H. D., Wellsborough, Pa.
Dozier, Wm., Mattoon, Ill.
Dewhurst, Rev. E., Voluntown, Conn.
Day, Theodore, Dyberry, Pa.
Dawson, Wm., Spiceland, Ind.
Dechant, W. H., Mananoy Plane, Pa.
Davis, W. O., Bloomington, Ill.
Dinsmore, Jr., Prof. T. H., Emporia, Kans.
Everett, Dr. J. T., Clyde, Ohio.
Ellsworth, W. W., Hartford, Conn.
Eliason, W. A., Statesville, N. C.
Eckstein, Rev. M., Conception, Mo.
Ellis, John, Marquette, Nebr.
Ewell, Dr. M. D., South Evanston, Ill.
Fox, G. W., Marietta, Cal.
Ford, H. C., El Dorado, Kans.
Ferris, B. F., Sunman, Ind.
Friend, Chas. W., Carson City, Nev.
Fleming, J., Readington, N. J.
Field, Theo. G., Parkersburg, W. Va.
Fernald, Prof. M. C., Orono, Me.
Frick, John H., Warrenton, Mo.
Foss, E. T., Hydesville, Cal.
Fuller, Edw. N., Tacoma, Wash. T.
Gore, Prof. J. W., Chapel Hill, N. C.
Gray, F. R., Yates Centre, Kans.
Gates, W. B., Burlington, Vt.
Graves, A. B., Belleville, Kans.
Gillingham, Milnor, Fallsington, Pa.
Gardiner, R. H., Gardiner, Me.
Gustin, M., Troy, Pa.
Gowey, H. D., North Lewisburg, Ohio.
Green, Dr. Jesse C., West Chester, Pa.
Gerrish, S. H., Sacramento, Cal.
Gray, J. W., Stockham, Nebr.
Goodwin, Wm., North Colebrook, Conn.
Goodspeed, Chas. W., Elyria, Ohio.
Gillingham, W., Accotink, Va.
Garlick, Rev. Dr. J. R., Bruington, Va.
Gray, Capt. A. W., Kenewick, Wash. T.
Heath, E. R., Wyandotte, Kans.
Harvard College Observatory, Cambridge, Mass.
Hammitt, John W., College Hill, Ohio.
Heaton, Isaac E., Fremont, Nebr.
Hoskinson, R. M., Bainbridge Island, Wash T.
Heacock, J. L., Quakertown, Pa.
Hyde, G. A., Cleveland, Ohio.
Haywood, John, Westerville, Ohio.
Hartzler, J. A., Mottville, Mich.
Hole, Joseph, Butlerville, Ind.
Hager, Mrs. L. G., Terre Haute, Ind.
Held, Rev. F. B., Mount Angel, Oreg.
Houghton Farm Experiment Station, Mountainville, N. Y.
Heatwole, L. J., Dale Enterprise, Va.
Hazen, Rev. A. Deerfield, Mass.
Hamilton, W. H., Corsicana, Tex.
Hatch, A. H., Windsor, Ill.
Harris, W. C., Dover, N. J.
Hodge, Rev., F. B., Wilkesbarre, Pa.
Humphrey, Dr. L., Fairbury, Nebr.
Hall, J. B. Worcester, Mass.
Hunter, Dr. T. C., Napoleon, Ohio.
Hall, Chas. C., Dudley, Mass.
Horn, Dr. H. B., Atchison, Kans.
Harlin, Rev. Wm., Antrim, N. H.
Helm, Thos. B., Logansport, Ind.
James, John W., Marengo, Ill.
Jones, Dr. E. U., Taunton, Mass.
Jackson Company, Nashua, N. H.
Jordan, Dr. M. D. L., Milan, Tenn.
Jones, Ira B., Neillsville, Wis.
Jones, F. M., Puerto de Luna, N. Mex.
Kirkwood, E., Manzy, Ind.
Knapp, J. G., Limona, Fla.
Keese, G. Pomeroy, Cooperstown, N. Y.
Kuhne, F. W., Fort Wayne, Ind.
King, W. R., Yellow Springs, Ohio.
Kent, Miss E. ily, Phillipsburg, N. J.
Kedzie, D. H. Midland, Tex.
Keese, G. Pomeroy, Cooper-stown, N. Y.
Lueps, Miss Anna, Manitowoc, Wis.
Lincoln, A. T., Marion, Va.
Loomis, J. C., Jeffersonville, Ind.
Luther, S. M., Garrettsville, Ohio.
Ladshaw, Geo. E., Pacolet, S. C.
Lamb, Miss Bertha E., Sterling, Kans.
Loud, Prof. F. H., Colorado Springs, Colo.
Lerch & Rice, Bethlehem, Pa.
Lowndes, R. T., Clarksburg, W. Va.
Morgan, L. Ray, Philipsburg, Pa.
Miller, H. D., Drifton, Pa.
McDonogh Institute, McDonogh, Md.
McCready, Miss L. A., Fort Madison, Iowa.
Moore, C. R., Bird's Nest, Va.
Micklen, J. H., Variety Mills, Va.
Macrae, Colin, Kirkwood, S. C.
Meehan, Thos., Germantown, Pa.
Moore, Nathan, Grampian Hills, Pa.
Mikesell, Thos., Wauseon, Ohio.
Marshall, G., Cresco, Iowa.
Mitchell, Dr. D. W., Harrisville, Mich.
Moore, Dr. J. W., Easton, Pa.
Motte, L. S., West Milton, Ohio.
Mackey, T. C., Gardiner, Oreg.
Newbegin, John D., Anna, Ill.
Newcomb, G. S., Westborough, Mass.
Norcom, Prof. T. J., Reidsville, N. C.
Neal, Dr. J. C., Archer Fla.
Nordberg, A., Richardton, Dak.
Olds, H. D., Cedar Rapids, Iowa.
Owsley, Dr. J. B., Jacksonborough, O.
Osborn, Dr. T. C., Cleburne, Tex.
Penrod, Dr. H. J., Upper Mount Clair, N. J.
Pearce, Thomas, Eola, Oreg.
Pifer, F. S., Hanover, N. H.
Partrick, J. M., North Volney, N. Y.
Purdue University, Lafayette, Ind.
Pettersén, Dr. F., Comfort, Tex.
Pendleton, A., Nicolaus, Cal.
Postma, H. Y., Egg Harbor City, N. J.
Roeder, W. F., Zionsville, Pa.
Robins, Chas. E., Alvah, Fla.
Rotch, A. L., Blue Hill Obs'y, Mass.
Romig, J. K., La Grande, Oreg.
Randall, E. H., Poultney, Vt.
Renfew, H. N., Bancroft, Iowa.
Remington, C. V. S., Fall River, Mass.
Robertson, T. D., Rockford, Ill.
Rogers, F. M., Luling, La.
Rerick, R. H., La Grange, Ind.
Rodman, T. R., New Bedford, Mass.
Runge, C., New Ulm, Tex.
Richardson, C. F., Beverly, N. J.
Rockwood, Prof. C. G., Princeton, N. J.
Smith, B. B., Topeka, Kans.
Shaw, E. Ninnescah, Kans.
Strong, W. C., Kent's Hill, Me.
Sanders, T. B. Susanville, Cal.
Smith, H. D., Muscatine, Iowa.
Shriver, E. T., Cumberland, Md.
Seltz, Chas., De Soto, Nebr.
Scott, Thos. G., Forsyth, Ga.
Stucky, Dr. C. T., Helvetia, W. Va.
Slade, Elisha, Somerset, Mass.
Shriver, Howard, Wytheville, Va.
Sonedecker, Rev. T. H., Fostoria, Ohio.
Stunkard, L. E., East Brook, Pa.
Snow, Prof. F. H., Lawrence, Kans.
Sim, J. R., Summit, Va.
Scribner, H. F. J., Strafford, Vt.
Strong, S. B., Setauket, N. Y.
Somerville, W. B., Birmingham, Ala.
Samestz, Oscar, Austin, Tex.
Safford, A. T., Williamstown, Mass.
Sherman, W. B., Manchester, Iowa.
Standenmayer, Dr. L. R., Lincolnton, N. C.
Spilman, J. J., Pierce City, Mo.
Swezey, Prof. G. D., Crete, Nebr.
Sacred Heart College, Prairie du Chien, Wis.
Stails, T. J., Paris, Tenn.
Snell, S. C., Amherst, Mass.
Tilford, C. M., Mount Blanco, Tex.
Tremblay, Dr. J. B., Oakland, Cal.
Todd, Prof. David P., Amherst, Mass.
Thornton, Prof. N., Genesco, Ill.
Teele, Rev. A. K., Blue Hill, Mass.
Truman, Geo. S., Genoa, Nebr.
Turnbo, Silas C., Pro Tem, Mo.
Tillinghast, C. B., Albany, N. Y.
Terborg, Rev. J. E., Pekin, Ill.
Voegeli, Adolphus, Des Moines, Iowa.
Went, E. C., Frankfort, Ky.
Washburn Observatory, Madison, Wis.
Wild, Rev. E. P., Newport, Vt.
Williams, Rev. C. F., Ashwood, Tenn.
Wing, Miss M. E., Charlotte, Vt.
West, Silas, Cornish, Me.
Wylie, Wm., Mount Forest, Canada.
Wait, S. E., Traverse City, Mich.
Woodstock College, Woodstock, Md.
Whittaker, J. S., Corydon, Iowa.
Wolfe, John H., Wellington, Kans.
West, Dr. Jos. O., Princeton, Mass.
Washington Aqueduct. — Receiving Reservoir, D. C; Distributing " ; Great Falls Reservoir, Md; Rock Creek Bridge, D. C.
Winipiseogee Lake Cotton and Woolen Manufacturing Co. — Weir's Bridge, N. H.; Woodstock, N. H.; Wolfborough, N. H.; Lake Village, N. H.; Bristol, N. H.; Belmont, N. H.; Ashland, N. H.
Willis, O. R., A. M., Ph. D., White Plains, N. Y.
Watters, Dr. Jas., Westmoreland, Kans.
Williams, Dr. A. C., Elk Falls, Kans.
Wigg, Dr. Geo., East Portland, Oreg.
Wright, J. W. A., Greensborough, Ala.
Whitmore, J. E., Gallinas Spring, N. Mex.
Wadsworth, Dr. J. L. R., Collinsville, Ill.
Widman, Rev. C. M., Grand Coteau, La.
Williams, Dr. A. C., Elk Falls, Kans.
Watson, Evan, Fort Scott, Kans.
White, Rev. J. H., Merritt's Island, Fla.
Whitney, Chas. E., Humphrey, N. Y.
Wilson, W. T., Clayton, N. J.
Wood, Jos., Bar Harbor, Me.
Wearmouth, J., University of Virginia, Va.
Waterman, Wm., Hay Springs, Nebr.
Yetter, Wm. G., Catawissa, Pa.
Yates, T. P., Factoryville, N. Y.
Young, Geo. R., Penn Yan, N. Y.

Military posts from which meteorological reports were received, through the Surgeon General of the Army, in time to be used in the preparation of the Monthly Weather Review for June, 1886.

Alcatraz Island, Cal.	Columbus, Fort, N. Y. H.	Keogh, Fort, Mont.	Monroe, Fort, Va.	Reno, Fort, Ind. T.	Supply, Fort, Ind. T.
Angel Island, Cal.	Concho, Fort, Texas.	Lowell, Fort, Ariz.	McDowell, Fort, Ariz.	Riley, Fort, Kans.	Totten, Fort, Dak.
Assiniboine, Fort, Mont.	David's Island, N. Y. H.	Laramie, Fort, Wyo.	McHenry, Fort, Md.	Ringgold, Fort, Tex.	Townsend, Ft., Wash. T.
A. Lincoln, Fort, Dak.	Ellis, Fort, Mont.	Lewis, Fort, Colo.	Mount Vernon B'ks, Ala.	Spokane, Fort, Wash. T.	Union, Fort, N. Mex.
Benicia Barracks, Cal.	Fred Steele, Fort, Wyo.	Mead, Fort, Dak.	Niagara, Fort, N. Y.	Snelling, Fort, Minn.	Verde, Fort, Ariz.
Bidwell, Fort, Cal.	Gaston, Fort, Cal.	McKinney, Fort, Wyo.	Niobrara, Fort, Nebr. [Cal.	Saint Augustine, Fort, Fla.	Washakie, Fort, Wyo.
Brady, Fort, Mich.	Gibson, Fort, Ind. T.	McIntosh, Fort, Tex.	Presidio of San Francisco,	Sisseton, Fort, Dak.	West Point, N. Y.
Bridger, Fort, Wyo.	Halleck, Fort, Nev.	Missoula, Fort, Mont.	Plattsburg Barracks, N. Y.	Shaw, Fort, Mont.	Walla Walla, Ft., Wash. T.
Bayard, Fort, N. Mex.	Hays, Fort, Kans.	Mason, Fort, Cal.	Pembina, Fort, Dak.	Selden, Fort, Nebr.	Wingate, Fort, N. Mex.
Boise, Fort, Idaho.	Huachuca, Fort, Ariz.	Madison Barracks, N. Y.	Randall, Fort, Dak.	Sully, Fort, Dak.	Yates, Fort, Dak.
Coeur d'Alene, Ft., Idaho.	Klamath, Fort, Oreg.	McDermit, Fort, Nev.	Robinson, Fort, Nebr.	Sidney, Fort, Nebr.	

State weather services from which meteorological reports were received in time to be used in the preparation of the Monthly Weather Review for June, 1886.

Alabama State Weather Service, under direction of Prof. P. H. Mell, jr., Auburn, Alabama.
Colorado State Weather Service, under direction of Prof. F. H. Loud, Colorado Springs, Colorado.
Georgia Weather Service, under direction of Hon. J. T. Henderson, Commissioner of Agriculture, Atlanta, Georgia.
Indiana State Weather Service, under direction of Prof. H. A. Huston, La Fayette, Indiana.
Minnesota State Weather Service, under direction of Prof. W. W. Payne, Northfield, Minnesota.
Missouri State Weather Service, under direction of Prof. Francis E. Nipher, Saint Louis, Missouri.
Nebraska Weather Service, under direction of Prof. Goodwin D. Swezey, Crete, Nebraska.
New England Meteorological Society, Prof. Winslow Upton of Providence, R. I., President; Mr. W. M. Davis, of Cambridge, Mass., Secretary.
Ohio State Weather Service, under direction of Prof. B. F. Thomas, of the Ohio State University, Columbus, Ohio.
Tennessee State Weather Service, under direction of Major H. C. Bate, Nashville, Tennessee.
Data have also been used from meteorological records of the Central Pacific and Southern Pacific railway companies.

PRICE-LIST OF

STANDARD METEOROLOGICAL INSTRUMENTS, APPARATUS, TEXT-BOOKS, FORMS, AND PUBLICATIONS.

Furnished by Henry J. Green, 771 Broadway, New York City.

BAROMETERS.

Common pattern and finish, vernier reading to 100th inch, in pine box:

Reading down to 26 inches	$20.00	Packing and shipping by express,	$2.50
do. 24 do.	21.00	do.	2.50
do. 20 do.	25.50	do.	2.50
do. 14 do. (two verniers)	33.00	do.	2.00

Common pattern and finish, vernier reading to 1,000th inch, in pine box:

Reading down to 26 inches	$34.00	Packing and shipping by express,	$2.50
do. 24 do.	36.00	do.	2.50
do. 20 do.	40.00	do.	2.50
do. 14 do. (two verniers)	54.00	do.	2.50

Best pattern and finish, vernier reading to 1,000th inch, in pine box:

Reading down to 26 inches	$36.00	Packing and shipping by express,	$2.50
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do. 20 do.	42.00	do.	2.50
do. 14 do. (two verniers)	55.00	do.	2.50
Leather case, in place of pine box	5.00	do.	——
Marine barometer	33.00	do.	2.50
Mountain barometer, two verniers, in leather case, to 20,000 feet	63.00	do.	2.50
Mountain barometer, two verniers, in leather case, to 18,000 feet	50.00	do.	2.50
Standard barometer for observatories	75.00	do.	3.25
Barometer tube (glass)	1.25	do.	1.00
Barometer tube, filled and replaced	3.00	do.	2.50
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Thermometer for dry or wet bulb	$ 2.00	Packing and shipping by express,	$ .60
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do. do. cup for	.90	do.	.25
do. dry-bulb, support for	.15	do.	.25
do. maximum registering	5.00	do.	.60
do. minimum do.	4.00	do.	.60
do. solar radiation	10.00	do.	.75
do. terrestrial radiation	7.00	do.	.60
do. small, in metal case, for pocket, engraved scale	2.50	do.	.25
do. water	5.00	do.	.60

L. R. 11547, P. D., 1882.

Anemometer, "Robinson's," (velocity)	$22.50	Packing and shipping by express,	$1.10
Electrical recording apparatus, "Gibbon's," (velocity). (L. R. 4315, P. D., 1880.)	24.00	do.	1.10
Anemometer blanks (L. R. 8827, P. D., 1886)		per hundred...	1.00

*Furnished by the Hahl Manufacturing Company, 13 Mercer Street, Baltimore, Maryland.**

Anemograph register (direction and velocity)	$0.00	Packing and shipping by express,	$1.20

* L. R. 11355, P. D., 1882.

Furnished by John McDermont & Bros., 319 Pennsylvania Avenue, Washington, D. C.

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do. "Ecaard's" attachment for use with anemograph	10.00	do.	——
do. base for anemograph	10.00	do.	——
Anemometer, telescopic rod for, new pattern	37.00	do.	3.00

L. R. 11327, P. D., 1882.

Furnished by L. H. Rogers, 75 Maiden Lane, New York City.

Signal Service manifold Forms No. 107 A, in books of 100 forms, per book			$ 1.25
do.	107 B,	do.	1.25
do.	107 C,	do.	1.35
do.	107 D,	do.	1.60
do.	107 E,	do.	1.60
do.	107 F,	do.	1.75
do.	107 G,	do.	2.25
do.	107 H,	do.	1.00
do.	107 H-sub,	do.	1.75
Indications (Form 100 B), per hundred			.22

L. R. 13367, P. D., 1885.

Furnished by James J. Chapman, 915 Pennsylvania Avenue, Washington, D. C.

"Loomis'" Meteorology	1.60

L. R. 4321, P. D., 1883.

Furnished by John Schultheis, 626 7th Street, Washington, D. C.

Rain-gauge, standard 5-inch Signal Service *	$5.00
Rain-gauge, galvanized iron, with overflow and measuring-stick	2.50
Rain-gauge, copper, with galvanized iron overflow and measuring-stick	1.50
Measuring-sticks, extra	.25
Farmers' weather-case	54.70
Case for water thermometer	7.50

L. R. 4031, P. D., 1883. * L. R. 11275, P. D., 1885.

Furnished by Crane & Co., McWhorter and Oliver Streets, Newark, New Jersey.

Rain-gauge, standard 8-inch, Signal Service	5.00

Furnished by Property and Disbursing Officer, Signal Service, U. S. A., Washington, D. C.

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Maps on manifold paper without reports or lines, in books of 100, per book	2.75
Maps in one color with current reports, isobars, and isotherms, each	.02
Monthly Weather Review	.10
Copies of Daily Bulletin, with Synopsis, Indications, and Facts, with maps, stitched in monthly volumes, each (L. R. 10288, P. D., 1881)	2.25
International Daily Bulletin, per copy, each, including the Monthly Summary when daily is subscribed for for the entire month	.11
District Maps, each	.02

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$13 from M. G. Copeland & Co., No. 634 Louisiana Avenue, Washington, D. C. (standard bunting);

$15 from Crane & Co., McWhorter and Oliver Streets Newark, New Jersey;

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$15 from Horstmann Bros. & Co., Fifth and Cherry Streets, Philadelphia, Pennsylvania, ("Eagle" bunting);

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